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THE

MEDICAL AND SURGICAL HISTORY

OF THE

WAR OF THE REBELLION.

(1861-65.)

PREPARED, IN ACCORDANCE WITH ACTS OF CONGRESS, UNDER THE DIRECTION OF

Surgeon General JOSEPH K. BARNES, United States Army.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1870.

WAR DEPARTMENT,
SURGEON GENERAL'S OFFICE,
November 12, 1870.

In the first year of the War it became evident that the form of Returns of Sick and Wounded, then in use, were insufficient and defective; and, on May 21, 1862, measures were taken by the then Surgeon General of the Army, Wm. A. Hammond, to secure more detailed and exact reports of sick and wounded, by important modifications in the returns from medical officers. On June 9, 1862, the intention to prepare for publication a Medical and Surgical History of the Rebellion was announced to the Medical Staff, in a Circular from the Surgeon General's Office. On July 1, 1863, a Consolidated Statement of Gunshot Wounds, by Surgeon J. H. Brinton, U. S. Volunteers, then in charge of the Surgical Records, and Curator of the Army Medical Musuem; and on September 8, 1863, a Report on Sickness and Mortality of the Army during the first year of the War, prepared by Assistant Surgeon J. J. Woodward, U. S. Army, in charge of the Medical Records, were published by this Office.

The necessity for a thorough revision of the Returns of Sick and Wounded becoming apparent, a Medical Board was assembled for this purpose, in July, 1862, and subsequently the following order was promulgated:

[CIRCULAR No. 25.]

GENERAL ORDERS
No. 355.

WAR DEPARTMENT,
ADJUTANT GENERAL'S OFFICE.
Washington, November, 4, 1863.

Medical Directors of Armies in the field will forward, direct to the Surgeon General, at Washington, duplicates of their reports to their several Commanding Generals, of the killed and wounded, after every engagement.

By order of the Secretary of War:

(Signed:) E. D. TOWNSEND,
Assistant Adjutant General.

SURGEON GENERAL'S OFFICE,
Washington, D. C., Nov. 11, 1863.

To carry out the intentions of the above order, Medical Directors of Armies in the field will detail suitable officers, who will, under their instructions, collate and prepare for transmission to this office, all obtainable statistics and data in connection with past and

future operations of those armies, which may be essential or useful in the accurate compilation of the Medical and Surgical History of the War.

Particular attention is called to the following points: The morale and sanitary condition of the troops; condition and amount of medical and hospital supplies, tents, ambulances, etc.; the points at or near the field where the wounded were attended to; degree of exposure of wounded to wet, cold, or heat; adequacy of supplies of water, food, stimulants, etc.; mode of removal of wounded from field to field hospitals; to what general hospitals the wounded were transferred, by what means and where; the character and duration of the action, nature of wounds received, etc. When practicable, separate casualty lists will be made of commissioned officers, non-commissioned officers, and privates. The attention of all medical officers is earnestly directed to the importance of this subject; without their cooperation no reliable record can be preserved—the vast experience of the past will remain with individuals, and be lost to the service and the country.

J. K. BARNES,
Medical Inspector General,
Acting Surgeon General.

To facilitate the collection and preservation of all important information, medical officers serving with regiments in the field were furnished, in January, 1864, with a compact and portable Register of Sick and Wounded, and the following instructions were issued:

[CIRCULAR LETTER.]

SURGEON GENERAL'S OFFICE,
Washington, D. C., January 20, 1864.

The Register of Sick and Wounded hitherto in use in the U. S. A. General Hospitals is hereby discontinued. In lieu thereof will be substituted two Registers for each General Hospital, viz.:

1. A Register of Sick and Wounded.

2. A Register of Surgical Operations.

In the former the appropriate entries will be made whenever a patient is admitted into hospital, and during his subsequent stay therein; and, to assist in the preparation of this Register, a new form of Bed-Cards has been adopted.

In the "Register of Surgical Operations," will be entered, minutely and in detail, the particulars of all operations performed, or treated in hospital. These entries should be made by the medical officers in charge of wards.

The above Registers and Bed-Cards are now in the hands of the Medical Purveyors, ready for issue, and you are directed to make immediate requisition for the same, adopting them as soon as received.

J. K. BARNES,
Acting Surgeon General.

To the Surgeon-in-charge of ———
U. S. A. General Hospital.

In February, 1864, separate Reports were ordered to be made for Sick and Wounded Rebel Prisoners of War, and for White and Colored Troops, in order to obtain with greater facility the sickness and mortality rates of each.

A Classified Return of Wounds and Injuries received in Action, a Report of Wounded, and a Report of Surgical Operations, were adopted in March, 1864, and distributed with the following circulars:

[CIRCULAR LETTER.]

SURGEON GENERAL'S OFFICE,
Washington, D. C., March 23, 1864.

Medical Directors of Armies in the field will issue the "Classified Return of Wounds and Injuries received in Action," to the Chief Medical Officers of Corps and Divisions, who will see that they are properly distributed.

This form, correctly filled up by the Senior Medical Officer of the command engaged, will be transmitted, in duplicate, through the proper channel, to the Medical Director of the Army within three days after every action.

The Medical Director of the Army will, as soon as possible, forward to the Surgeon General a Consolidated Return of all Casualties, according to the same form. He will, at the same time, transmit one copy of all Duplicate Returns received from his subordinate Medical Officers.

J. K. BARNES,
Acting Surgeon General.

[CIRCULAR LETTER.]

SURGEON GENERAL'S OFFICE,
Washington, D. C., March 28, 1864.

SIR:

You are hereby directed to fill up the accompanying "Report of Wounded" and "Report of Surgical Operations" for the months of January, February, and March, 1864.

The Report of Wounded will consist of an accurate and legible copy of all cases of wounded entered on the Hospital Register during the quarter.

The Report of Surgical Operations will consist of a correct copy of the Register of Surgical Operations for the same period.

A list of wounded remaining under treatment on the 31st December, 1863, in the hospital under your charge, and on furlough, is enclosed; you are directed to fill up the column "Result and Date," opposite the respective names.

Additional details for the present quarter, of "Surgical Operations remaining under treatment December 31, 1863," you will report on appended slips of paper.

Blank sets of Reports on Secondary Hæmorrhage, Tetanus, and Pyæmia, are also enclosed. These you will fill up in the usual manner. Should no such cases have occurred in the hospital under your charge during the time specified, you will so state in your letter of transmission.

All of the reports above alluded to will, when compiled, be forwarded directly to the Acting Surgeon General.

By order of the Acting Surgeon General:

C. H. CRANE,
Surgeon U. S. Army.

Medical Officer in charge of ———
U. S. A. General Hospital.

Contemporaneously with the establishment of a more accurate system of Medical and Surgical reports, a pathological collection was commenced, which, under the charge of Surgeon J. H. Brinton, U. S. Volunteers, and Assistant Surgeon J. J. Woodward, U. S. Army, became the basis of the Army Medical Museum, itself, as it now exists, an eloquent and instructive history of the Medicine and Surgery of the War, and without which no history could have been completely illustrated.

The announcement of this project was cordially responded to by Medical Officers throughout the service; and the list of contributors comprises the names of many most eminent for zeal and ability in the discharge of their duties under the Government, whose honorable records are identified with this work.

The following Circular was published more to secure a certain class of specimens, than to stimulate the liberality with which most valuable pathological material was being forwarded:

[CIRCULAR LETTER.]

SURGEON GENERAL'S OFFICE,
Washington, D. C., June 24, 1864.

Medical Officers in charge of Hospitals are directed to diligently collect and preserve for the Army Medical Museum, all pathological surgical specimens which may occur in the hospitals under their charge.

The objects which it is desired to collect for the Museum may be thus enumerated:

Fractures, compound and simple; fractures of the cranium.
Excised portions of bone.
Diseased bones and joints.
Exfoliations; especially those occurring in stumps.
Specimens illustrative of the structure of stumps, (obliterated arteries, bulbous nerves, rounded bones, etc.)
Integumental wounds of entrance and of exit, from both the round and conoidal ball.
Wounds of vessels and nerves.
Vessels obtained subsequent to ligation, and to secondary hæmorrhage.
Wounded viscera.
Photographic representations of extraordinary injuries, portraying the results of wounds, operations, or peculiar amputations.

Models of novel surgical appliances, and photographic views of new plans of dressing.
Plaster casts of stumps and amputations, and models of limbs upon which excisions may have been performed.

It is not intended to impose on Medical Officers the labor of dissecting and preparing the specimens they may contribute to the Museum. This will be done under the superintendence of the Curator.

In forwarding such pathological objects as compound fractures, bony specimens, and wet preparations generally, obtained after amputation, operation, or cadaveric examination, all unnecessary soft parts should first be roughly removed. Every specimen should then be wrapped separately in a cloth, so as to preserve all spiculæ and fragments. A small block of wood should be attached, with the name of the patient, the number of the specimen, and the name of the medical officer sending it, inscribed in lead pencil. The inscription will be uninjured by the contact of fluids. The preparation should be then immersed in diluted alcohol or whiskey, contained in a keg or small cask. When a sufficient number of objects shall have accumulated, the cask should be forwarded directly to the Surgeon General's Office. The expenses of expressage will be defrayed in Washington. The receipt of the keg or package will be duly acknowledged by the Curator of the Museum.

In every instance, a corresponding list or history of the cases should, at the same time, be forwarded to this office. In this list the number and nature of every specimen should be clearly specified, and, when possible, its history should be given. The numbers attached to the specimens themselves, and the numbers on the list forwarded should always correspond, and should be accompanied by the name and rank of the medical officer by whom sent. Every specimen will be duly credited in the Catalogue to the medical officer contributing it.

J. K. BARNES,
Acting Surgeon General.

In order to perfect the returns under examination, as far as possible, the following Circular was issued:

[CIRCULAR LETTER.]

SURGEON GENERAL'S OFFICE,
Washington, D. C., February 2, 1865.

Medical Directors of Armies in the field or of detached commands are instructed to transmit to this Office copies of all reports in their possession from the Recorders of Division or other Field Hospitals, and in future, copies of such reports will be forwarded to the Surgeon General within twenty days after every engagement.

Medical Directors of Departments will forward to this Office copies of all reports of individual cases of gunshot injury antecedent to the adoption of the present system of registration of wounds, (October 1, 1863,) which are on file in their offices.

By order of the Surgeon General:

C. H. CRANE,
Surgeon U. S. Army.

On April 6, 1866, a letter was addressed to each Medical Director, requiring that all Registers of Hospitals, Consolidated Registers of Soldiers treated, and all information in their possession pertaining to the Sick, Wounded, Discharged, and Dead during the war, should be transferred to this Office. Careful revision of the material accumulated up to that date, had established its immense value to the civilized world, and it seemed to be demanded that, in justice to humanity, and to the national credit, it should, at once, be made available by publication.

By authority of the Secretary of War, Hon. Edwin M. Stanton, Circular No. 6, A Report upon the Extent and Nature of the Materials available for the preparation of a Medical and Surgical History of the War, was published, and an edition of seven thousand five hundred copies distributed.

Encouraged by the approbation of Secretary Stanton, who took the deepest interest in its success, and aided by his powerful influence, an application was made to Congress, and an appropriation was granted June 8, 1868, for the purpose of preparing for publication, under the direction of the Secretary of War, five thousand copies of the First Part of the Medical and Surgical History of the Rebellion, compiled by the Surgeon General, and on March 3, 1869, by a Joint Resolution of Congress, the number of copies mentioned above was authorized to be printed at the Government Printing Office.

Assistant Surgeon J. J. Woodward, U. S. Army, who had been in charge of the Medical Records since June 9, 1862, and Assistant Surgeon George A. Otis, U. S. Army, who was assigned to the charge of the Surgical Records, October 3, 1864, were directed to prepare the work for publication; the zeal and intelligence of these Officers having been already fully established.

No work of this character, of equal magnitude, had ever been undertaken; the Medical and Surgical History of the British Army which served in Turkey and the Crimea during the war against Russia in 1854, 1855, and 1856, and the Medico-Chirurgical Report of Doctor J. C. Chenu upon the Crimean Campaign, published by the French Government in 1865, being the only national publications on military medicine and surgery.

It was not considered advisable to follow the classification of either of these works, and a plan was determined on which it is believed will be found adapted to the preservation of the great mass of facts collected, in a form for convenient study. Through the liberality of the Government, in its beneficent pension laws, it has been found practicable to obtain accurate histories of many thousand wounded or mutilated men for years subsequent to their discharge from service.

The success which has attended this effort to ascertain the ultimate results of operations or conservative measures, employed in the treatment of the wounded in the late war, is largely owing to the cordial coöperation of the Surgeons General and Adjutants General of States, the Examining Surgeons of the Pension Bureau, and very many private Physicians throughout the country. As in the official returns of the casualties of the French and English Armies in the Crimean War, the cases were dropped when the men were invalided, pensioned, or discharged from service, this information was considered peculiarly desirable.

In carrying out the intentions of Congress, it has been my earnest endeavor to make this Medical and Surgical History of the War, not only a contribution to science, but an enduring monument to the self-sacrificing zeal and professional ability of the Volunteer and Regular Medical Staff, and the unparalleled liberality of our Government, which provided so amply for the care of its sick and wounded soldiers. To the Medical Officers connected more immediately with this work, for most cordial assistance and unceasing industry; to those who, at the close of the war, returned to civil life; to the members of the Medical Staff of the Army and Officers of the various Bureaux of the War Department, for the courtesy and promptness with which requests for information have invariably been responded to, I am deeply indebted. My thanks, and those of every possessor of these volumes, are especially due to the Superintendents of the Government Printing Office, and their skilled assistants, who have spared no pains in making the typography and execution of this publication worthy of the Government and the Nation it represents.

JOSEPH K. BARNES,
Surgeon General U. S. Army.

THE

MEDICAL AND SURGICAL HISTORY

OF THE

WAR OF THE REBELLION.

PART I.

VOLUME II.

SURGICAL HISTORY.

Prepared, under the direction of JOSEPH K. BARNES, Surgeon General United States Army,

By GEORGE A. OTIS, Assistant Surgeon United States Army.

INTRODUCTION.

In the preparation of the surgical portion of the *Medical and Surgical History of the War of the Rebellion*, it was at first proposed to treat of the surgery in connection with the military operations in the several battles and campaigns. Surgeon John H. Brinton, U. S. V., originally assigned to the task,* prosecuted his work on this plan. After giving a general account of a campaign, enumerating the troops engaged, the mode of transporting the injured, and the available hospital accommodations, the wounds and operations of each engagement were discussed, the reports of medical directors, and all other reliable sources of information being brought into requisition. Among these were observations personally made in the base and field hospitals of the armies of the Potomac and of the West, after the great battles, where much valuable surgical material was collected, including admirable illustrations of the graver injuries, pathological specimens, and a series of excellent surgical drawings. Such a plan was adapted to the outset of the War, when its extent and protracted duration was anticipated by no one; but toward the close of the year 1864, it became apparent that a plan susceptible of wider generalization must be adopted, for the clerical force then at the disposition of the Surgeon General was hardly sufficient to classify the immense returns from the hospitals and battle-fields of the Army of the Potomac alone. During that year there were no less than two thousand skirmishes, actions, or battles, and to have given a correct analysis of the casualties from the returns from the field and base hospitals would have been impossible. For the number of wounded received at the Washington hospitals alone, during the quarter ending June 30th, 1864, was over thirty thousand, and the total number of wounded reported by all the general hospitals exceeded eighty thousand.

Therefore, in 1865, it was suggested, in the report of materials available for a Surgical History of the War† that the wounds and operations be classified according to regions,—important cases being described at length, and brief abstracts or numerical tabular statements being furnished of the less important cases.

It was decided that this plan should be adopted, and that the reports of medical directors and others, relating to the field service, should be published as "appended documents" to the Medical and Surgical History. They are bound in Volume I, Part I.

In the preliminary surgical report in *Circular* No. 6, S. G. O., 1865, the materials available for a complete surgical history are fully described, and in the introduction to the medical volume of Part I, of the *Medical and Surgical History*, the form of the monthly report of sick and wounded required of each hospital, post, regiment, or detachment at the beginning of the war, and the various modifications made in the blanks during its progress are clearly explained, and the causes of discrepancies and probabilities of errors plainly pointed out. It remains only to advert briefly to some other sources of information of an exclusively surgical nature. Though, from the beginning, it had been customary for

* See *Circular* No. 5, Surgeon General's Office, June 9th, 1862. † *Circular* 6, S. G. O., 1865.

medical directors to forward to the Surgeon General lists of the killed and wounded after each engagement, it was not until late in 1863,* that these returns were made obligatory and rigorously exacted. They were of the greatest utility in furnishing the means of tracing patients to base or general hospitals, where their histories were more fully detailed. The lists were on forms, twelve by sixteen inches, ruled as follows:

List of Wounded in the ..... Brigade, ... Division, ... Corps, Army of ....., at the Battle of ..... on the ..... day of ....., 186 .....

NUMBER.	NAMES.		RANK.	COMPANY.	REGIMENT.	CORPS.	INJURY.			TREATMENT.	RESULT AND DATE.	REMARKS
	Surname.	Christian name.					Missile or Weapon.	Seat of.	Nature of (slight or severe.)			

NOTE I.—This List will be made with the strictest accuracy, and will be transmitted by the Medical Directors of Corps to the Medical Director of the Army, *within seven days* after an engagement. The names of all men treated in the Hospital will be entered upon this List. When men are transferred to or from other Division Hospitals, the fact of the transfer and the date will be noted in the "Remarks."

NOTE II.—It is enjoined upon Medical Officers to state in the column "Nature of Injury," whether the wound is a flesh-wound or a fracture or a penetrating wound of a cavity.

.....

Surgeon in Chief ..... Division, ... Corps.

The pocket field register, five and one-half by eight and one-fourth inches, referred to by the Surgeon General on page IV of his prefatory remarks, as issued to regimental surgeons, answered a like useful purpose. It was ruled as below. Only about five hundred were transmitted to the Surgeon General's Office at the close of the war

Register and Prescription Book of ..... Regiment .....

NO.	NAME.	RANK.	REG'T.	COMP.	DISEASE.	IN HOSPITAL OR QUARTERS.	PRESCRIPTION AND REMARKS.

* See GENERAL ORDERS No. 355, *War Department*, Adjutant General's Office, November 4th, 1863.

It was found, as the troops were massed in a few large armies, that it was requisite to obtain more prompt information of the aggregate of casualties than was afforded by the nominal returns Hence the following form was employed. It appears to have been filled out with great fidelity:

Classified Return of Wounds and Injuries received in action on the ..... day of ....., 186 ,

at .... Division ..... Corps, Army of .....

REGION OF BODY WOUNDED.		Total number wounded.	Deaths.	NATURE OF MISSILE OR WEAPON.						OPERATIONS AND DEATHS.						Chloroform administered in.	Deaths from.	REMARKS.
				Cannon Ball.	Shell.	Bullet.	Sword.	Bayonet.	Other or undetermined means.	Amputations.	Deaths following.	Excisions.	Deaths following.	Other Operations.	Deaths following.			
FLESH WOUNDS.	Head																	
	Face																	
	Neck																	
	Thoracic Parietes																	
	Abdominal Parietes																	
	Shoulder																	
	Back and Hips																	
	Perineum, Genital, and Urinary Organs																	
	Cranial Bones																	
	Bones of Face																	
PENETRATING WOUNDS.	Thorax																	
	Abdomen																	
ARM.	Flesh Wound																	
	Fracture																	
	Shoulder Joint																	
	Elbow Joint																	
FOREARM.	Flesh Wound																	
	Fracture																	
	Wrist Joint																	
	Metacarpus																	
	Fingers																	
	Hip Joint																	
THIGH.	Flesh Wound																	
	Fracture, upper 3d																	
	Fracture, middle 3d																	
	Fracture, lower 3d																	
	Knee Joint																	
LEG.	Flesh Wound																	
	Fracture																	
	Ankle Joint																	
	Metatarsus																	
	Toes																	
Wounds with direct injury of large arteries, not being at the same time cases of compound fracture																		
Wounds with direct injury of large nerves, not being at the same time cases of compound fracture																		
TOTAL																		

..... Surgeon,

.... Division, ... Corps,

Army of .....

NOTE.—This statement will be transmitted, *in duplicate*, by the Medical Directors of Army Corps to the Medical Director of the Army within *five* days after an engagement. No excuse will be received for failure in its transmittal within the time here directed.

JOSEPH K. BARNES,
Acting Surgeon General.

The wounded man being transferred as soon as practicable to an hospital of comparative permanency, he was taken up on one or both of the following forms:

Report of Wounded ..... *U. S. A. General Hospital* ..... *for the months of* ..... , 186 .

Hospital Number.	Name.	Rank.	Company.	Regiment.	Age.	When Admitted.	From what General Hospital Transferred.	From what other Source Admitted. From Field, from Field Hospital, etc.	Diagnosis. In Surgical Cases, state Seat and Character of Wound or Injury.	On what Occasion Wounded. Date.	In Surgical Cases only. Nature of Missile or Weapon. Round or conical bullet, solid shot, bayonet, sword.	In Surgical Cases only. Treatment. Amputation.....Date of Excision..... " " Other operation.. " " Simple dressings.	Result. Returned to duty. Date.	Result. Transferred to Veteran Reserve Corps. Date.	Result. Transferred to other General Hospital, State, or City. Date.	Result. Furloughed. Date.	Result. Deserted. Date.	Result. Discharged from Service. Date.	Result. Death. Date.	Re-admitted from Furlough or Desertion. Date.	Remarks. Here state cause of death, of discharge, or of transfer to Veteran Reserve Corps.

Report of Surgical Operations ..... *U. S. A. General Hospital,* ..... *for the months of* ..... , 186 .

Hospital Number.	Name, Rank, Company, Regiment, Age, Date of Admission to Hospital.	Description and Date of Wound or Injury; on what Occasion Received.	Date of Operation.	Operation. *Amputation.*—Flap, Circular, Oval, etc. *Excision.*—Extent of Incision. Parts removed, etc. *Other Operations.*—State Anæsthetic.	Condition of Injured Parts at Time of Operation.	Constitutional State of Patient at Time of Operation.	Progress, Treatment, etc.	Result (Give date of), Cause of Death.	Remarks. Here state name and rank of Operator. Post-mortem Observations, etc., etc.

That a continuous record might be kept, the names and military descriptions of all surgical patients remaining under treatment at the conclusion of the quarter, were copied, at the Surgeon General's Office, from the quarterly reports of wounds and of operations, upon folio blanks of the form following. These lists were mailed to the hospitals, where the progress or result of each case was recorded, and the paper thence returned with the succeeding quarterly reports:

List of Wounded remaining under treatment at ..... *U. S. A.* ..... *Hospital, at the beginning of the quarter which ends* ....., 186....

[NOTE.—This form, with the column "Result and Date" properly filled up, will be returned by the Medical Officer in charge to the Surgeon General, U.S.A.]

HOSPITAL NUMBER.	NAME.	CO.	REGIMENT.	DIAGNOSIS.	RESULT AND DATE.

Prior to the adoption of the quarterly reports of wounded and of operations, patients were supplied with descriptive lists, on foolscap, ruled and lettered in the following form. Except in cases of transfer, these were not filled out with much fidelity, but occasionally they furnished important facts and even histories of grave cases that would otherwise have escaped notice:

MEDICAL DESCRIPTIVE LIST.

Ward ....., *Bed* ..... *General Hospital at* .....

Name ....., *Age* ....., *Rank* ....., *Co.* ....., *Regiment* .....

Disease or Injury, ...

Result, ...

(Name of attending Medical Officer.)

.....

DATE OF { *Admission,* .....; *Return to duty, cured,* .....; *Furlough,* .....; *Discharge from service,* .....; *Transfer to another Hospital,* .....; *Death,* ..... }

NOTE.—When a patient is first received into a General Hospital, the entries on this Descriptive List will be commenced. All important changes in his condition will be noted on it (in ink), from time to time, by the Surgeon in charge of the Ward. When the patient has been wounded, the date and character of the wound will be stated, the nature of the operation (if any), and, above all, the result. In case of transfer, this list will be sent, through the officer in charge of the transportation, or failing one, by mail, to the Surgeon in charge of the Hospital receiving the patient. When this medical history shall have been completed, by the cure, discharge, furlough, or death of the patient, it will, with the treatment and result carefully noted, be transmitted directly to the Surgeon General.

DATE.	TREATMENT.	DIET.	REMARKS AS TO CONDITION OF PATIENT, &C.

There was the following endorsement:

Name of Hospital, ...
Name of Patient, ...
Disease or Injury, ...
Result, ...
Date of Transmission, ...

The entries on bed-cards sometimes supplied missing links, in tracing the chain of evidence of important cases. These cards were printed on thick paper or card-board, five and one-half by three and one-half inches, and were classified and transmitted to the Surgeon General's Office when the hospital closed. The form of the cards used (face and back) may be seen below:

Form of Bed-card used in the United States General Hospitals.

HOSPITAL NUMBER .....

Name .....
Age ....., *Nativity* .....
Married or Single .....
Residence .....
Post-Office address of wife or nearest relative, ...

Rank ....., *Co.* ....., *Regiment* .....

When admitted .....
From what source .....

Diagnosis :—(In surgical cases state explicitly seat and character of wound or injury.)

On what occasion wounded .....
Date .....
Nature of missile or weapon .....

TREATMENT.

[HERE NOTE IMPORTANT COMPLICATIONS AND ALL OPERATIONS.]

RESULT AND DATE.

It was anticipated that much information would be derived from the discharge papers for physical disability, but, after a laborious examination it was found that the surgical certificates were generally brief and vague, and comparatively useless for statistical purposes. The rolls of soldiers transferred to the Invalid Corps were searched with nearly the same result, the surgical memoranda being practically worthless. The objects in view in the formation of this corps were perverted, many sound, healthy soldiers being transferred to suit the convenience of officers who took them from the ranks to serve as clerks, cooks, nurses, or other attendants, and it became necessary that the corps should be reorganized. This was effected by discharging and pensioning the utterly disabled men, and dividing the remainder, according to the extent of their disabilities, into two battalions of "Veteran Reserve Corps," the second battalion being composed largely of men maimed by the loss of a limb. The entries were useless in a surgical point of view, being as concise as: "amputation." or "amputated leg," or "excised elbow." When, in 1866, four regiments* of Veteran Reserves were incorporated with the Regular Army, the Surgeon General instructed the examining surgeons, at the recruiting stations, to take careful notes of all extraordinary cases of injury or mutilation presented to them. Through this channel much valuable material was obtained.

The numerous survivors of grave wounds and mutilations who have visited Washington to prosecute their pension claims, or to solicit places under Government, or to obtain orders for artificial limbs, generally visit the Army Medical Museum, and the writer has thus had the opportunity of personally examining such cases, and of preparing six quarto volumes of photographs of the more remarkable examples† The Museum also

* The 42d, 43d, 44th, and 45th United States Infantry.

† Sets of these volumes have been distributed, by the Surgeon General's direction, to the principal medical colleges and learned societies of the country.

possesses fourteen quarto volumes of contributed photographs, and a vast number of card-size pictures, indexed and classified, but not bound.

The formal reports of medical directors of armies give a general view of the operations of the Medical Department. For the Army of the Potomac, the reports of Medical Directors King, Tripler, Letterman, and McParlin furnish a connected narrative of the services rendered by the medical staff For the western armies, the reports of Medical Directors McDougall, Murray, Mills, Cooper, Swift, Perin, Moore, J. H. Brinton, and Hewit afford similar information. These papers depict an outline of the surgery of the war, and place in evidence the immensity of the task that devolved on the Medical Department, and vindicate its achievements, in showing the extent of the succor given to the wounded in despite of almost incredible obstacles. Besides these authoritative documents, there are on file in the office, to serve as supplementary reports, individual narratives of observations in active service from each member of the regular or volunteer medical staff. Such portions of these reports as appeared to possess historical interest are printed in the *Appendix to Part I* of this work.

Much important and otherwise unattainable information regarding the ulterior consequences of the more important and rare injuries has been collected by private correspondence with invalided soldiers and their surgical advisers. More than fifteen hundred cases have been examined in this way.[1]

Several interesting cases and valuable pathological specimens have been contributed by officers of the medical staff of the United States Navy.[2]

Many of the former medical officers of the Confederate army have aided in the prosecution of the work by contributing histories of cases, pathological specimens, statistical data, and facts concerning the terminations of the major injuries and operations. It may be permitted to express the hope that the claims of these gentlemen, with those of all others who have contributed largely to the materials available for their preparation, will be favorably considered by Congress, in the distribution of these volumes.[3]

But the principal sources from which the remote results of wounds, injuries, and operations were ascertained, were the reports of pension examiners, and communications from the surgeons general and adjutants general of States. The cordiality and zeal with which all of these officials have responded to every enquiry of this office, and facilitated its researches in many ways, have been acknowledged, but cannot be too highly appreciated.[4]

[1] Not infrequently the addresses of survivors of rare injuries or operations were unknown, and resource was had to various expedients by advertising in the secular press and elsewhere. Thus the ultimate results of Dr. Read's case of successful excision at the knee-joint and Dr. Compton's primary amputation at the hip-joint were determined.

[2] See *Specs.* 5884 and 2273, Sect. I, Army Medical Museum, for cases of coxo-femoral exarticulations by Surgeon W. E. Taylor, U. S. N., and Surgeon A. C. Gorgas, U. S. N., and *Spec.* 5662, presented by Passed Assistant Surgeon R. J. Tryon, U. S. N., for a fracture of the leg produced by a torpedo explosion. Dr. Tryon also communicated a number of surgical memoranda from his private case-book.

[3] Among the large number who have thus contributed, I may enumerate the following, with whom I had the pleasure of personal correspondence: Dr. THOMAS WILLIAMS, formerly medical director of the Army of Northern Virginia; Professor HUNTER MCGUIRE, late medical director of General Jackson's Corps; Dr. J. F. GILMORE, late chief medical officer of General McLaws's Division of General Longstreet's Corps; Dr. JOHN D. JACKSON, late surgeon P. A. C. S.; Dr. W. W. COMPTON, of Holly Springs, Mississippi; Dr. CLAUDE H. MASTIN, late medical inspector C. S. A; D. J. F. GRANT, of Pulaski, Tennessee; Dr. W. L. BAYLOR, of Petersburg, Virginia; Professor J. J. CHISHOLM, of Baltimore, Maryland; Professor MILES, of Baltimore, Maryland; Dr. H. L. THOMAS, of Richmond, Virginia; Dr. T. G. RICHARDSON, of New Orleans; Dr. J. R. BUIST, of Nashville, Tennessee; Dr. A. C. CRYMES, Fort Browder, Alabama; Dr. A. M. FAUNTLEROY, of Hunton, Virginia.

[4] Where all coöperated cheerfully, according to the opportunities at their command, it is hoped that it may not be deemed invidious to advert particularly to the pains taken by the successivo adjutants general of New York and Pennsylvania to trace the histories of invalids unaccounted for on the national records, and to the kind and constant interest shown in the work by Surgeon General W. J. Dale, of Massachusetts, Surgeon General James E. Pomfret, of New York, formerly surgeon of the 7th New York Artillery, and Surgeon General H. H. Smith, of Pennsylvania. Among the pension examiners, of whom many, fortunately for all concerned, were formerly military surgeons, cordial and discriminating assistance has been received from Drs. F. Salter and T. B. Hood, late staff-surgeons of volunteers, and Dr. A. L. Lowell; from Dr. A. N. Dougherty, late medical director of the Second Corps; from Drs. G. Derby and S. A. Green, of Boston, Drs. H. S. Hewit and George Suckley, of New York, late medical directors of the Armies of the Ohio and of the James; from Drs. George C. Harlan and H. E. Goodman, of Philadelphia, Prof. F. Bacon, of New Haven, Dr. D. W. Maull, of Wilmington, Drs. T. W. Wishart, and G. McCook, of Pittsburg, Dr. H. M. Dean, of Litchfield, Dr. J. M. Woodworth, late medical inspector of the Army of the Tennessee, Dr. C. S. Wood, of New York, Dr. T. H. Squire, of Elmira, and many others.

It is unnecessary to enlarge on the great facilities afforded by the unrivalled collections of the Army Medical Museum.[1] It is sufficient to say that it possesses over six thousand surgical preparations, affording illustrations of the primary, intermediary, and remote effects of most of the injuries incident to war, and of the morbid processes, which characterize the different stages of most surgical diseases. It contains, also, a collection of weapons and projectiles, a good series of dissections and studies in topographical anatomy, many wax, plaster, leather, and papier-maché casts of the results of operations, and a large number of specimens, models, and drawings illustrating the materia chirurgica and methods of transport for the wounded.

The various manuals and systematic treatises on military surgery and the numerous contributions on the subject published in periodicals during the war, or since its conclusion, have been carefully and often advantageously consulted.[2]

Another and a very valuable store of information was added, at the close of the war, in the shape of portions of the Confederate Hospital Records. These comprised the consolidated monthly reports of sick and wounded of the Army of Northern Virginia from July 21st, 1861, to May 3d, 1863; two hundred and thirty-three hospital registers; one hundred and sixty case books; fifty-two diet and prescription books; seventy-eight order and letter books, and a number of records of clothing issues and other administrative matters. There were also many books of miscellaneous memoranda,* and a large collection of monthly and quarterly sick reports, discharge papers, muster and pay-rolls, reports of boards of survey, and the like.

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[1] Of osteological preparations of the results of injuries of the head there are 422 specimens; of wet preparations of lesions of the soft parts, casts of plastic operations, etc., 72 specimens; of specimens of injuries and diseases of the spine, 128; of preparations of all kinds illustrating wounds and injuries of the chest, there are 210 specimens, and of similar preparations belonging to the abdomen, 82; 1,340 specimens illustrate the amputations and 1,209 specimens the excisions, and there are 1,570 preparations of the different degrees of destruction or repair in the injuries of the bones of the extremities.

*Among them an exceedingly interesting volume containing the correspondence between a benevolent society, entitled the "Association for the Relief of Maimed Soldiers," of which Dr. W. A. Carrington, C. S. A., was secretary, and a coöperative association in England, presided over by Lord Wharncliffe. From this volume the details of many cases of amputations and excisions have been gleaned, which will appear in their proper places in this History.

[2] Among the *American* books and papers on military surgery, that have been consulted, the following may be enumerated. The foreign medico-military bibliography will be referred to further on: JONES, J., *Plain, Concise, Practical Remarks on the Treatment of Wounds and Fractures, with an Appendix on Camp and Military Hospitals, Principally designed for the use of young Military and Naval Surgeons in North America*, Philadelphia, 1776; RUSH, *Medical Inquiries and Observations*, Philadelphia, 1793-94, Vol. I of his works; BARTON, *A Treatise on Marine, Flying, and Military Hospitals*, Philadelphia, 1817; MANN, J., *Medical Sketches of Campaigns*, 1812-1814, Dedham, 1816; PARSONS, U., *Prize Dissertations on Inflammation of the Periosteum, Encuresis Irritata, Cutaneous Diseases, Cancer of the Breast, Malaria*, 2d ed., Providence, 1849; PORTER, J. B., *Medical and Surgical Notes of Campaigns in the War with Mexico, during the years* 1845, 1846, 1847, *and* 1848, Am. Jour. Med. Sci., Vols. XXIII, XXIV, XXV, and XXVI, January, 1852, to January, 1853; WRIGHT, J. J. B., *On a Gunshot Perforation of the Chest* (in Dr. F. H. Hamilton's *Pract. Treat. on Mil. Surg.*, 1861, p. 157); JARVIS, N. S., *Am. Jour. Med. Sci.;* HULSE, G. W., *Gunshot Wound of the Head*, New York Jour. of Med. and Surg., January, 1841; HENDERSON, T., *Topography of Madison Barracks*, Am. Jour. Med. Sci., April, 1841; Vol. I, N. S. p. 337; LAWSON, T., *Meteorological Register for the years* 1826 *to* 1830, *inclusive, From observations made by the surgeons of the army and others at the military post of the U. S. Army, To which is appended the Meteorological Register for the years* 1822 *to* 1825, *inclusive, by Joseph Lovell*, Philadelphia, 1840; FORRY, S., *Statistical Researches on Pulmonary and Rheumatic Diseases, based on the Records of the Medical Department, U. S. Army*, Am. Jour. Med. Sci., Vol I, N. S., 1841, p. 13; TRIPLER, C. S., *Manual of the Medical Officer of the Army of the United States*, Part I, Cincinnati, 1858; TRIPLER, C. S., and BLACKMAN, G. C., *Handbook for the Military Surgeon*, Cincinnati, 1861; CHISHOLM, J. J., *A Manual of Military Surgery, for the use of Surgeons in the Confederate States Army*, 3d ed., Columbia, 1864; HAMILTON, F. H., *A Practical Treatise on Military Surgery*, New York, 1864; and *A Treatise on Military Surgery and Hygiene*, New York, 1865; GROSS, S. D., *A Manual of Military Surgery*, Philadelphia, 1861; WARREN, E., *An Epitome of Practical Surgery for Field and Hospital*, Richmond, 1863; *Manual of Military Surgery, Prepared for the use of the Confederate States Army, by order of the Surgeon General*, Richmond, 1863; SMITH, S., *Handbook of Surgical Operations*, 3d ed., New York, 1862; SMITH, S., *Statistics of the Operation of Amputation at the Hip-Joint*, in New York Journal of Medicine, Sept., 1852, p. 93; COOLIDGE, R. H., *Statistical Report on the Sickness and Mortality in the Army of the United States, Compiled from the Records of the Surgeon General's Office, Embracing a period of sixteen years, from January*, 1839-55, Washington, 1856; the same, *Embracing a period of five years, from January*, 1855-60, Washington, 1860; WARREN, J. M., *Surgical Observations, with Cases and Operations*, Boston, 1867; NOTT, J. C., *Contributions to Bone and Nerve Surgery*, Philadelphia, 1866; SCHUPPERT, M., *A Treatise on Gunshot Wounds, Written for and dedicated to the Surgeons of the Confederate States Army*, New Orleans, 1861; ANDREWS, E., *Complete Record of the battles fought near Vicksburg, December*, 1862, Chicago, 1863; BARTHOLOW, R., *A Manual of Instruction for enlisting and discharging soldiers*, Philadelphia, 1864; BOWDITCH, H. I., *A brief plea for an Ambulance System for the Army of the United States*, Boston, 1863; and *On Pleuritic Effusions, and the necessity of Paracentesis for their removal*, Am. Jour. Med. Sci., Vol. XXIII, 1852, p. 320; BRINTON, J. H., *Consolidated Statement of Gunshot Wounds*, Washington, 1863; BECKER, A. R., *Gunshot Wounds, Particularly those caused by newly invented missiles*, 1865; BUCK, G., *History of a Case of Partial Reconstruction of the Face*, Albany, 1864; and, *Case of destruction of the body of the Lower Jaw and extensive disfiguration of the Face from a Shell Wound*, Albany, 1866; and, *Description of an Improved Extension Apparatus for the treatment of Fracture of the Thigh*, New York, 1867; DERBY G., *The Lessons of the War to the Medical Profession*, Mass. Med. Soc. Pub. Vol. 2, Boston, 1867; ELLIS, T. T., *Leaves from the Diary of an Army Surgeon*, New York, 1863; GREEN, J., *On Amputation of the Thigh*, Boston Med. and Surg. Jour., June, 1863; EVE, P. F., *A Contribution to the History of the Hip-Joint Operations Performed during the late Civil War*, in Transactions Am. Med. Association.

The bulk of these documents were received from the officer entrusted with turning over public property under the convention between General Sherman and General Johnston, April 26th, 1865. Other fragmentary portions were obtained from defeated and retreating forces, or from captured places. It is greatly to be deplored that many more of these precious documents were destroyed than were preserved,—being burned or scattered to the winds wantonly, or in ignorance of their value. It must be admitted further, that a few of the volunteer medical officers retained, for their private use, medical documents and pathological preparations that came into their possession. It is difficult to understand such dereliction of duty, in view of the certainty of detection, since the publication or the exhibition of such data alone would involve an admission of disobedience of orders.

The Confederate medical records in the possession of this Office appear, as a general rule, to have been kept with commendable exactness, and it is remarkable that physicians called suddenly from civil practice should have so speedily mastered the intricacies of military routine. The forms were, in nearly all instances, identical with those employed prior to the war in the United States Army, and the medical regulations were almost literally the same, with the exception, in both cases, of the substitution of the words *Confederate States* for *United States*, wherever the latter occurred. The organization of the medical hierarchy was very similar to that of the Union Army. There was a Surgeon General, assisted by Medical Directors and Medical Inspectors, assigned to military departments or to armies in the field; a regular staff, composed chiefly of officers who had withdrawn from the old army or navy, who signed as Surgeons or Assistant Surgeons, C. S. A., a corps analogous to the Staff Surgeons of Volunteers of the Union Army, its members being addressed as Surgeons or Assistant Surgeons P. A. C. S.;* regimental surgeons and assistant surgeons, and physicians employed by contract. The inspections appear to have been frequent and thorough, and special commissions were sometimes instituted to enquire into the prevalence of hospital gangrene, erysipelas, tetanus, scurvy, and various epidemics.†

Among the means adopted in the Confederate army for collecting information on special subjects in military medicine, surgery, and hygiene, was the organization of a society of surgeons of the army and of the navy at Richmond. The following circulars

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Vol. XVIII, pp. 256, 263; GAY, G. H., *A few Remarks on the Primary Treatment of Wounds received in battle*, Boston, 1862; GOLDSMITH, M., *A Report on Hospital Gangrene, Erysipelas, and Pyæmia, as observed in the Departments of the Ohio and Cumberland*, Louisville, 1863; HODGEN, J. T., *Wound of Brain*, St. Louis Med. and Sur. Jour., Vol. V, 1868, p. 405; *Surgeons Reel and Artery Forceps*, St. Louis Med. and Surg. Jour., Vol. IV, 1867, p. 151; and *On Fractures*, St. Louis Med. and Surg. Jour., Vol. VII, 1870; HUDSON, E. D., *Save the Arm, Remarks on Exsection*, etc., New York, 1864; and *Mechanical Surgery*, New York, 1871; HARWITZ, P. T., *Report of Casualties from Gunshot Wounds in the U. S. Navy*, from April 2d, 1861, to June 30th, 1865, Washington, 1866; LETTERMAN, J., *Medical Recollections of the Army of the Potomac*, New York, 1866; LIDELL, J. A., *A Memoir on Osteo-myelitis*, New York, 1866; and, *On the Wounds of Blood-Vessels*, etc.; *On the Secondary Traumatic Lesions of Bone*, etc.; and, *On Pyæmia*, New York, 1870; MOTT, V., *Hæmorrhage from Wounds and the best means of Arresting it*, New York, 1863; MITCHELL, S. W., *Injuries of Nerves and Their Consequences*, Philadelphia, 1872; MOSES, I., *Surgical Notes of Gunshot Injuries occurring during the advance of the Army of the Cumberland*, 1863, Am. Jour. Med. Sci., Vol., XLVII, p. 324, 1864; MCGILL, G. M., *Observation Book, National and Hicks U. S. A. General Hospitals, Baltimore, Maryland*, Baltimore, 1865–66; ORDRONAUX, J., *Manual of Instructions for Military Surgeons, on the Examination of Recruits and Discharge of Soldiers*, New York, 1863; OTIS, G. A., Surgical Part of the *Reports on the Nature and Extent of the Materials available for the Preparation of a Medical and Surgical History of the Rebellion*, being Part I, of Circular 6, S. G. O., 1865; and *A Report on Amputation at the Hip-Joint in Military Surgery*, Circular 7, S. G. O., 1867; and *A Report on Excision of the Head of the Femur for Gunshot Injury*, Circular No. 2, S. G. O., 1869; and *A Report of Surgical Cases treated in the Army of the United States from* 1865 *to* 1871, Circular No. 3, S. G. O., 1871; PACKARD, J. H., *A Handbook of Operative Surgery*, Philadelphia, 1870; SMITH, H. H., *Principles and Practice of Surgery*, Philadelphia, 1863; SMITH, N. R.; *Treatment of Fractures of the lower extremity by the use of the Anterior Suspensory Apparatus*, 8vo., Baltimore, 1867; SMITH, D., *Experiences in the Practice of Military Surgery*, Am. Med. Times, 1862, Vol. IV, p. 331; SMITH, G. K, *The Insertion of the Capsular Ligament of the Hip-Joint, and its Relation to Intro-Capsular Fracture*, New York, 1862; THOMSON, W., *Report of Cases of Hospital Gangrene treated in Douglas Hospital, Washington, D. C.*, Am. Jour. Med. Sci., Vol., XLVII, 1864, p. 378; WAGNER, C., *Report of Interesting Surgical Operations*, Performed at the U. S. Army General Hospital, Beverly, New Jersey, 1864; WOODWARD, *Report on the Causes and Pathology of Pyæmia*, Trans. Am. Med. Assoc., Vol., p. 172, 1866; READ, J. B., *Report on Wounds of the large Joints*, Southern Med. and Surg. Journal, July and October, 1866.

* Provisional Army of the Confederate States.

† Some of these reports, on gangrene, typhoid fever, and the mortality of prisoners at Andersonville, have been published by the Sanitary Commission: *Memoirs of the War of the Rebellion*, Vol. I, 1867, Vol. II, 1871, New York, Hurd and Houghton, 8 vo. pp. 667, 580, with colored plates.

will indicate the general scope of their inquiries. Reference is frequently made in this work to the printed and unpublished proceedings of this society:

"SIR: With the view of reaching the individual experience and opinions of surgeons and assistant surgeons on debatable points in surgical pathology, based upon their observations in this war, an "*Association of Army and Navy Surgeons*" has been organized, and your co-operation in carrying out the successful fulfilment of its purpose is solicited.

Questions proposed by the president will be forwarded, and as early a reply as practicable will be necessary in order that a majority vote may be taken in the decision.

The following are the questions:

I. In gunshot wounds, do such differences exist between the orifices of *entrance* and *exit* as to indicate them with certainty?

II. Have gunshot wounds, in your experience, ever assumed the appearance of incised wounds and healed by first intention?

III. When suppurating, which orifice seems to heal first?

SAM'L PRESTON MOORE,
Pres't Ass'n A. & N. Surgeons.

SIR: In replying to questions, and in essays or papers sent to the association, a *résumé* is requested, coming to some conclusion, in order to facilitate taking the vote in the decision on the subject.

The following questions are proposed:

I. Any DEATH from chloroform in YOUR practice? give particulars of the case, if any. Is this agent always used?

II. 1st. Does 'SHOCK' postpone YOUR surgical interference? At what period of time, after injury, are YOU usually able to operate? 2d. Any relation between the CHARACTER of the injury and the GRAVITY of the shock? 3d. Any death, in your practice, from shock alone?

III. Do CICATRICES from gunshot wounds furnish YOU information as to the nature of the missile which caused the injury, and the probable ENTRANCE and EXIT of the same?

Further particulars on these subjects, with accounts of any remarkable course which balls may have taken in transit through the body, in your own practice, are solicited.

Third series of questions:

V. What NUMBER of cases have been followed by SECONDARY hæmorrhage after ligation of artery ABOVE the wound? Mention vessel, part of artery wounded, and the point ligated.

VI. In arresting hæmorrhage, has local deligation, or ligature ABOVE the wound proved the safer method in YOUR hands? In how many cases have you resorted to the one or the other? mention vessels injured.

VII. Have hæmostatics proved of any avail in YOUR experience? How have they been used?

VIII. How many cases of GANGRENE have followed ligation for PRIMARY hæmorrhage and how many for SECONDARY hæmorrhage?"

The replies to these enquiries, and the discussions on the subjects to which they relate, furnished much interesting material, which has been partly compiled and published in the first volume of the Confederate States Medical and Surgical Journal, and as the fourteen numbers of that work that were published are now very rare, no hesitation has been felt in reproducing, with due acknowledgment, the reports of cases, clinical records, debates, and discussions, in which the surgical experience acquired by the Confederate medical officers is partially set forth. The general conclusions will be found to corroborate, in most instances, those accepted by the surgeons of the Union Army. This is conspicuously true in regard to the relinquishment of depleting measures in the treatment of gunshot wounds of the chest, in the sound practice that gradually came to prevail in the treatment of wounds of arteries, and in the estimates formed of the applicability of the special excisions, and the limits to be assigned to conservative measures. On one point, the closing of gunshot flesh wounds after their conversion into incised wounds, with the hope of healing by first intention, a procedure warmly advocated by the Confederate surgeons Chisholm and Michel, the theory and practice were alike rejected by the Union surgeons. The plan was tried in the New Zealand war, by instructions of the English Director-General, but the reports of Inspector General Mouat, and of Staff-surgeon A. D. Home, though not decisive, were unfavorable.

Since the conclusion of our own struggle, two great wars have convulsed Europe,—the Austro-Prusso-Italian, or "Six Weeks War" of 1866, and the German-French War of 1870–71. It has been sought to compare our results with those set forth in the already numerous publications of the German and French military surgeons.[1] I have also continually referred to the reports of the antecedent or contemporaneous or subsequent wars in Algeria,[2] in Schleswig-Holstein (1848–50),[3] in the Crimea (1854–56),[4] in Italy (1859),[5] in the Prusso-Danish War of 1864,[6] in the Sepoy Mutiny,[7] and the English and French expeditions to China,[8] the New Zealand War (1863–65),[9] and the Abyssinian invasion (1868).[10]

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[1] DOYON, A., *Notes et Souvenirs d'un Chirurgien D'Ambulance*, Paris, 1872; GRELLOIS, E., *Histoire Médicale du Blocus De Metz*, Metz, 1872; CHIPAULT, A., *Fractures par Armes à Feu, Expectation, Resection sous-Periostée, Evidement-Amputation, Armée de la Loire*, Paris, 1872; VASLIN, L., *Étude sur les Plaies par Armes à Feu*, Paris, 1872; FISCHER, H., *Kriegschirurgische Erfahrungen*, Erlangen, 1872; LE FORT, L., *La Chirurgie Militaire et les Sociétés de Secours en France et a l'Étranger*, Paris, 1872; MACCORMAC, W., *Notes and Recollections of an Ambulance Surgeon*, London, 1871; MACDOWALL, C. J. F. S., *On a New Method of Treating Wounds (Gruby's System) and the Medical and Surgical Aspects of the Siege of Paris*, London, 1871; BILLROTH, T., *Chirurgische Briefe aus den Kriegs-Lazarethen in Weissenburg und Mannheim*, 1870, Berlin, 1872; DESPRÉS, A., *Rapport sur les Travaux de la 7ème Ambulance a l'Armée du Rhin et à l'Armée de la Loire*, Paris, 1871; SAZARIN, M. C., *Clinique Chirurgicale de l'Hôpital Militaire de Strasbourg*, Strasbourg, 1870; SCHATZ, J., *Étude sur les Hôpitaux sous Tentes*, Paris, 1870; BONNAFONT, J. P., *Du Fonctionnement des Ambulances Civil·s et Internationales sur le Champ de Bataille*, Paris, 1870; LANGENBECK, B., *Ueber der Schusswounden der Gelenke und ihre Behandlung*, Berlin, 1868; PASSAVANT, G., *Bernerkungen aus dem Gebiete der Kriegschurgie*, Berlin, 1871; IWANOFF, *Bericht ueber die Besichtigung der Militär-Sanitätanstalten in Deutschland, Lothringen und Elsass in Jahre* 1870, von N. Pirogoff, Leipsig, 1871; RUPPRECHT, L., *Militärärztliche Erfahrungen während des Franzochen Krieges* in Jahre 1870–71, Würzburg, 1871; ECKHART, *Geschichte des k. b. Aufnams-Feldspitals* XII, *im Kriege gegen Frankreich* 1870–71, Würzburg, 1871; BECK, *Kriegs-Chirurgische Erfarhungen während der Feldzuges* 1866 *in Süddentscheland*, Freiburg, 1867; SIMON, G., *Mittheilungen aus der Chirurgischen Klinik*, Prag, 1868; ROALDÈS, A. W. DE, *Des fractures compliquèes de la cuisse par Armes de guerre*, Paris, 1871; COUYBA, *Des Troubles trophiques consécutifs aux Lésions traumatiques de la Moëlle et des Nerfs*; CHRISTÔT, F., *Du Drainage dans les Plaies par Armes de Guerre*, Paris, 1871; QUESNOY, F., *Campagne de* 1870, *Armée du Rhin, Camp de Chalons, Borny, Rezonville ou Gravelotte, Blocus de Metz*, Paris, 1871; LATOUR, A., *Journal du bombardement de Châtillon*, Paris, 1871; JOULIN, *Les caravanes d'un chirurgien d'ambulances*, Paris, 1871.

[2] BERTHERAND, A., *Campagnes de Kabylie*, Paris, 1862; BAUDENS, *Clinique des Plaies d'Armes à Feu*, Paris, 1836; BAUDENS, *Relation Historique de l'Expédition de Tagdempt*, Paris, 1841; ARMAND, A., *L'Algérie Médicale*, Paris, 1854; VINCENT, *Exposé clinique des Maladies des Kabyles*, Paris, 1862; SÉDILLOT, C., *Campagnes de Constantine de* 1837, Paris, 1838; MARIT, *Hygiène de l'Algérie*, Paris, 1862; LECERC, *Une Mission Médicale en Kabylie*, Paris, 1864.

[3] STROMEYER, L., *Maximen der Kriegsheilkunst*, Hannover, 1855; ESMARCH, F., *Beschreibung einer Resectionsschiene. Ein Beitrag zur Conservativen Kriegsheilkunst, Mit Fünf Holzschnitten*, Kiel, 1859, and *Ueber Resectionen nach Schusswunden*, Kiel, 1851; SCHWARTZ, H., *Beiträge zur Lehre von den Schusswunden: Gesammelt in den Feldzügen der Jahre* 1848–50, Schleswig, 1854; GURLT, E., *Militär-Chirurgische Fragmente*, Berlin, 1864; LOHMEYER, *Die Schusswunden und ihre behandlung*, Goettingen, 1859; LŒFLER, *Grundsärtze und Régeln für die Behandlung der Schusswunden in Kriege*, Berlin, 1859; BECK, *Die Schusswunden*, Heidelburg, 1850; STROMEYER, *Ueber die bei Schusswunden vorkommenden Knochen-Verletzungen*, Freiburg, 1850.

[4] The principal authorities on the Surgery of the Crimean War are: MATTHEW, T. P., Surgical Part of the *Medical and Surgical History of the British Army in the Crimea, during the War against Russia, in the years* 1855 and 1856, London, 1858, Vol. II, p. 253; CHENU, J. C., *Rapport au Conseil de Santé des Armées sur les Résultats du Service Médico-Chirurgical aux Ambulances de Crimée et aux Hôpitaux Militaires Français en Turquie pendant la Campagne D'Orient en* 1854–1856, Paris, 1865; PIROGOFF, N., *Grundzüge der Allgemeinen Kriegschirurgie nach Reminiscenzen aus den Kriegen in der Krim und in dem Kaukasus*, Leipzig, 1864; SCRIVE, G., *Relation Médico-Chirurgical de la Campagne d'Orient*, Paris, 1857; BAUDENS, L. *La Guerre de Crimée, les Campements, les Abris, les Ambulances, les Hôpitaux*, etc., etc., etc., Deuxième édition, Paris, 1858; FRASER, P., *A Treatis upon Penetrating Wounds of the Chest*, London, 1859; LEGOUEST, L., *Traité de Chirurgie d'Armée*, Paris, 1863; SALLERON, M., *In Recueil de Mém. de Méd. et de Chir. Mil.*, 2d Série, T. 21, 1858, p. 320; LAWSON, *On Gunshot Wounds of the Thorax*, London; ARMAND, A., *Histoire Médico-Chirurgicale, de la Guerre de Crimée*, Paris, 1858; BLENKINS, *On Gunshot Wounds*, in 8th ed. of Cooper's Dictionary, London, 1869; BAUDENS, L., *Souvenirs d'une Mission Médicale a l'Armée d'Orient*, Paris, 1857; MACLEOD, G. H. B., *Notes on the Surgery of the War in the Crimea*, London, 1858; CAZALAS, L., *Maladies de l'Armée d'Orient*, Paris, 1860; PORTA. *Della Disarticulazione del Cotile*, Milano, 1860; MARROIN, *Histoire Médicale de la Flotte Françain dans le Mer Noire pendant le Guerre de Crimée*, Paris, 1861.

[5] CHENU, J. C., *Statistique Médico-Chirurgicale de la Campagne d'Italie en* 1859 *et* 1860, Paris, 1869; RODOLFI, R., *Campagna Chirurgica del* 1866, *Osservazioni Cliniche*, Milano, 1867; GHERINI, A., *Vade Mecum per le Ferite D'Arma da Fuoco*, Milano, 1866; GRITTI, R., *Dell Fratture del Femore per Arma da Fuoco*, Milano, 1866; ROUX, J., *De L'Ostéomyélite et des Amputations Secondaires à la Suite des Coups de Feu*, Paris, 1860; APPIA, P. L., *The Ambulance Surgeon*, Edinburgh, 1862; DEMME, H., *Studien Allgemeine Chirurgie der Kriegswunden*, Würzburg, 1861; STROMEYER, *Erfahrungen ueber Schusswunden* in Jaher 1865, Hannover, 1866; LOHMEYER, C. F., *Die Schusswunden und ihre Behandlung, Kurz bearbeitet*, Göttingen, 1859; BILLROTH, T., *Historische Studien über die Beurtheilung und Behandlung der Schusswunden vom* 15 *Jahrhundert bis auf die neueste Zeit*, Berlin, 1859; BERTHERAND, *Campagne d'Italie*, Paris, 1860; BRUCE, A., *Observations in the Military Hospitals of Dresden*, London, 1866; MAAS, H., *Kriegschirurgische Beiträge aus dem Jahre* 1866, Breslau, 1870; GURLT, E., *Der Internationale Schutz der im Felde Verwundeten und Erkrankten Krieger*, etc., Berlin, 1869; BOUDIN, J. C. M., *Souvenirs de la Campagne d'Italie*, Paris, 1861; EVANS, T. W., *Les Institutions Sanitaires pendant le Conflit Austro-Prussien-Italien*, Paris, 1867; NEUDÖRFER, *Handbuch der Kriegschirurgie*, Leipsig, 1864; CAZALAS, *Maladies de l'Armées d'Italie*, Paris, 1864.

[6] HANNOVER, A., *Das Endresultat der Resectionen im Kriege* 1864, *in den Unterklassen der Dänischen Armee, und Die Dänischen Invaliden aus dem Kriege* 1864, Berlin, 1870 (from von Langenbeck's Arch. f. k. ch. B. XII, H. 2); LŒFLER, F., *General-Bericht über den Gesundheitsdienst im Feldzuge gegen Dänemark*, 1864, Berlin, 1867; HEINE, C., *Die Schussverletzungen der unteren Extremitäten*, Berlin, 1866; OCHWADT, *Kriegschirurgische Erfahrungen*, Berlin, 1865; RESSEL, J., *Die Kriegshospitäler des St. Johanniter-ordens im Dänischen Feldzuge* von 1864, Breslau, 1866.

[7] WILLIAMSON, G., *Military Surgery*, London, 1863; FAYRER. J., *Clinical Surgery in India*, London, 1865; COLE, J. J., *Military Surgery or Experience of a Field Practice in India during the years* 1848 *and* 1849, London, 1852; GORDON, C. A., *Experiences of an Army Surgeon in India*, London, 1872.

[8] CASTANO, F., *L'Expédition de Chine*, Paris, 1864; DIDIOT, *Relation Médico-Chirurgicale de L'Expédition de Cochinchine*, Paris, 1865; LAURE, *Histoire médicale de la Marine Française, pendant les Exp dition de Chine et de Cochinchine*, Paris, 1864.

[9] MOUAT, J., *Special Report on Wounds and Injuries Received in Battle*, Extracted from the Medical and Surgical History of the New Zealand War, London, 1867.

[10] General NAPIER'S *Official Report*, London, 1869; *Papers connected with the Abyssinian Expedition*, presented to both Houses of Parliament, 1867.

In arranging the surgical data of the American war, it has been thought wisest to proceed from particulars to generals, and to begin with an account of the special wounds and injuries. Several advantages are secured by this arrangement. Thus the returns to the Adjutant General, Quartermaster General, and Surgeon General differ in their aggregates of *killed in battle*, and there are discrepancies in the reports of *wounded in action* made to the Adjutant General and to the Surgeon General. These statistics are still undergoing revision, and it may reasonably be anticipated that near approximations will be ultimately attained. Although the memoranda of 205,235 cases of wounds and injuries, including 39,163 operations, have been examined and compared and placed upon the permanent registers, yet many thousands of cases, belonging chiefly to classes not considered in the first volume, remain to be investigated and entered. Hence generalizations on the relative *frequency of wounds according to regions*, would be premature. The influence of climate and other hygienic conditions on the state of health of the troops, and consequently on the *results of wounds*, can be more readily appreciated when the Tables in the Medical Volume of Part I, shall have been discussed. Deductions derived from the vital statistics of the Provost Marshal General's Bureau, from the Census returns, and from the reports of the Commissioner of Pensions, will afford further data for general conclusions. From these and other considerations, it has been decided to postpone the general observations to a later portion of the work.

A chronological table of engagements and battles, compiled from official sources where practicable, but often from popular estimates that appeared to be honest attempts at fair approximations, and sometimes from almost any statement available that was not obviously false—such a table, in which completeness rather than unattainable accuracy is sought, is introduced to indicate the actions that were fought during the period of four years during which the war was protracted, from April, 1861, to April, 1865. The surgical history proper follows, and is continued through five chapters, the first chapter being devoted to wounds and injuries of the head, the second to those of the face, the third to those of the neck, the fourth to those in which injury of the spinal column was the most prominent feature, and the fifth to wounds and injuries of the chest. The operations performed are considered in connection with the injuries of each region, an arrangement much more difficult than a distinct classification, but affording many advantages, in avoiding repetitions and in presenting each subject as a whole. In the second volume, now nearly ready for the press, the wounds and injuries of the abdomen, pelvis, and genito-urinary organs, the upper and lower extremities with the amputations and excisions, are discussed; and in the third volume, gunshot wounds in general, with the complications of pyæmia, gangrene, tetanus, and secondary hæmorrhage will be considered, and also the materia chirurgica, the transportation and field supplies of the wounded.

It has been mentioned that the cases belonging to the regions which will come first under consideration, have been examined with especial care, and there are here probably few omissions, the aggregates being even larger than called for by the returns on the monthly reports, doubtless because of the number of Confederate cases included. Yet among these few omissions, it must be anticipated that some cases of especial interest may be included. Wounded officers, for example, were often treated in private quarters, and in many or most instances, it has been difficult to procure precise narratives of their cases.

The preliminary reports and the prefatory and introductory matter in the medical volume and in this, sufficiently place in evidence the impossibility of compiling a satisfactory surgical history of the war by the simple consolidation of data derived from any consecutive series of reports in existence. The inadequacy of the entries in the class *thanatici* of the monthly report of sick and wounded was early acknowledged, and it was officially declared that previous to September, 1862, "the surgical statistics of the war were absolutely worthless," and that "the only information procurable is such as can be derived from the examination of a mass of reports, all of which present merely certain figures under the vague and unsatisfactory heading, *Vulnus sclopeticum*.* After the revision of the forms of reports and the addition in June, 1862, of the "tabular statement of gunshot wounds and operations," the consolidations for the first two quarters of 1863 were found to abound in errors to such an extent that it was deemed inexpedient to print them. The quarterly reports of wounded and of surgical operations (*ante* p. xvi) and the nominal lists of casualties in battle were required in September and November, 1863; the classified return of wounds and injuries received in action was instituted in March, 1864.

The following is a consolidation of the aggregates of entries in Class V, of the monthly reports of sick and wounded, from May 1st, 1861, to June 30th, 1865, as printed in tables of the Medical Volume of Part I:

	CLASSIFICATION.	White Troops.		Colored Troops.		TOTAL.	
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1	Burns	9,487	94	613	4	10,100	98
2	Contusions	44,323	161	2,649	11	46,972	172
3	Concussion of Brain	873	193	49	22	922	215
4	Compression of Brain†	61	17	.....	.....	61	17
5	Drowning	.....	672	.....	125	.....	797
6	Sprains	38,387	3	4,317	.....	42,704	3
7	Dislocations	2,908	9	108	1	3,016	10
8	Fractures	1,287	53	.....	.....	1,287	53
9	Simple Fractures	4,215	61	131	15	4,346	76
10	Compound Fractures	1,316	378	55	19	1,371	397
11	Gunshot Wounds	229,119	32,731	6,466	922	235,585	33,653
12	Incised Wounds	21,444	186	1,305	3	22,749	189
13	Lacerated Wounds	14,153	459	595	8	14,748	467
14	Punctured Wounds	5,285	191	499	8	5,784	199
15	Poisoning	3,087	93	67	17	3,154	110
16	Other Accidents and Injuries	13,099	1,003	2,174	72	15,273	1,075
	Aggregates	389,044	36,304	19,028	1,227	408,072	37,531

* *Circular No.* 9, S. G. O., July 1st, 1863. *Consolidated Statement of Gunshot Wounds.* By Surgeon J. H. Brinton, U. S. V.
† After June 30th, 1863, this class was omitted, as it was found that depressed fractures of the skull were sometimes entered.

The aggregate of 235,583 gunshot wounds here given, with the resulting mortality of 33,653, or 14.2 per cent., is explained, in the introduction to the medical volume, to represent the total returned from about nine-tenths of the mean strength of the Union Army, and to be exclusive of the injuries of those killed in action. The latter category embraces, according to the Adjutant General, not less than 44,238; according to the alphabetical registers of the Surgeon General's Office, 35,408; according to the Chronological Summary, 59,860.*

However useful these approximations may be for many purposes, any anticipation that they may afford reliable guidance, or much assistance in framing a surgical history of the war, must evidently prove illusory. But the consolidation of the data of the detailed quarterly surgical reports might be justly expected to furnish a very complete record of the surgical practice in the Union Army during the latter two years of the war; and for the last year, the classified return of wounds received in action should serve as a nearly-accurate check-list.

The clinical histories contained in the quarterly surgical reports were provisionally classified in the order specified on page 6 of the Introduction to the surgical report in *Circular No.* 6, S. G. O., 1865. It has been severely criticised† and would be open to graver objections than have been offered, had it been designed as a nosological system. It was simply a nomenclature for a series of blank books, in which surgical facts derived from a variety of sources might be entered for facility of reference, and has been modified as frequently as convenience dictated. It has been found to answer the purpose for which it was intended reasonably well. As the presentation of the naked statistics of the monthly reports of sick and wounded, as consolidated on the preceding page, would have been

* The Chronological Summary, compiled by the faithful and indefatigable chief clerk of the Surgical Division, Mr. FREDERICK R. SPARKS, indicates the following losses: *Union Troops*, killed 59,860, wounded 280,040, missing 184,791; *Confederate Troops*, killed 51,425, wounded 227,871, missing 384,281. The last aggregate includes the armies surrendered. Allowing for many exaggerations and omissions, the errors appear to balance remarkably, and the results to correspond with statistics derived from entirely different sources.

† In the fifty-fourth volume of the *Medico-Chirurgical Transactions* is an article of fifty-two pages, by Deputy Inspector-General T. Longmore, C. B., on the classification and tabulation of injuries and surgical operations in time of war, in which he claims that some of the best established rules of field surgery, especially as regards gunshot injuries, have been attained by the collection of the statistical results of expectant and operative treatment; describes the classification adopted in the British army and those of other countries; considers how far those statistics are comparable; discusses which system ensures the greatest accuracy and completeness, with the greatest economy of labor and cost in compilation; advocates an international congress for the adoption of a uniform system, and concludes that the British system is the best. I cannot follow him through this discussion, but must correct several serious errors in his description of the "collection and classification of surgical statistics of war injuries in the United States." After premising that the figures of our tabular statements are "almost practically worthless," Dr. Longmore remarks that "the vast amount of labor and time" expended in their compilation was such that "as the documents successively arrived at the Surgeon General's Office in Washington, a large number of medical officers and clerks were occupied in classifying and transcribing their contents" (p. 223); and elsewhere, more specifically (p. 243), "the labor on the American system is so great, that an American friend once informed me that when he was in Washington there were two hundred intelligent clerks employed at the Surgeon General's Office in collecting and arranging the surgical statistics of the war, for the preparation and publication of which a very large sum of money had been liberally granted by Congress." I am sure that Dr. Longmore will wish to correct these misrepresentations. The maximum force employed, at any time, at the Surgeon General's Office, upon the surgical statistics of the war, has been one medical officer, one clerk, and sixteen hospital stewards, occasionally aided by one acting assistant surgeon; and the "very large sum of money" (£6,000), voted for the preparation of five thousand copies of the medical and surgical volumes of the First Part of the Medical and Surgical History of the War, only subserved its purpose because nearly all those occupied with the work were already in Government employ. I will not complain of the unfairness of contrasting the results of the preliminary report in *Circular* No. 6 with the perfected histories of Dr. Matthew and M. Chenu; but I do complain of an "American System" being described and unfavorably contrasted with the classification of Inspector-General Taylor, when, as I have shown, there was no complete series of surgical reports in the Army of the United States, and information was of necessity to be derived from heterogeneous data. "The surgeons in the field on the American system * * make no distinction between the various kinds of cranial fractures. * * Where all such injuries are tabulated together, as they are in the primary American returns, what useful information can be obtained from a table showing, for example, the results of the operation of trephining?" (p. 240). I cordially concur in the warm praise accorded to the histories of the Crimean and Italian campaigns by M. Chenu. I will observe that in his latter work he very materially modifies the classification employed in the former. In the history of the surgery of the Italian War, he reports nine cases of trephining; in his Crimean history Dr. Matthew reports twenty-six cases. I shall record two hundred and twenty cases, and shall be disappointed if their results afford no useful information. Dr. Taylor's classification may be excellent for the British army, with its corps of trained medical officers; it could not have been advantageously introduced in our service, chiefly attended by surgeons hastily called from civil life. Dr. Longmore says (p. 235) that in Germany "no fixed classification exists." This is quite true, yet the statistical work of General-Artz Dr. Loeffler is a marvel of accuracy and completeness to those who occupy themselves with these studies; and the extended treatises of Drs. H. Fischer, Socin, and Klebs, following so soon upon the conclusion of the Franco-German war, are monuments of well-directed industry. I think that in war "systems" must be made to conform to the exigencies of the occasion and to national habits and organizations. There are certain great rules to which all nations will conform; the details must be adapted to varying circumstances. The British system may be best for Britain; but not necessarily for all other countries. On peut être plus sage qu'un gens, mais point que tous les gens.

barren,—as there was no other consecutive series of reports,—and as it was undesirable to sacrifice the information collected in the earlier period of the war, a plan was adopted which permitted the endeavor to group together data from any quarter, from case books, from field registers, from nominal casualty lists, from numerical classified returns, from the memoranda accompanying pathological specimens, from the careful clinical records of hospitals, and the hasty pocket-book memoranda of field surgeons. From a surgical point of view, there was no motive to exclude information that could be obtained of the Confederate wounded,—*le vrai chirurgien ne regarde pas l'uniforme.* Estimates of the ratio of wounded to the forces engaged, and other attempts at approximations to unattainable numerical precision, were held to be very subordinate to the accumulation of the greatest possible number of practical surgical facts.

In dealing with these large bodies of facts, I have thought best, commonly, to imitate the practice of the legal profession, and to set forth all the evidence regarded as important, on each particular subject, with as little interruption as possible, and to append the argument or discussion. As nearly as practicable, the wounds and injuries and surgical diseases of each region of the body have been arranged together, as the simplest and most natural order that could be adopted. The most interesting clinical histories have been printed in full, or in abstracts including the attainable essential details, and the remaining cases, or sometimes the whole number of cases of the class, are set forth in tabular statements. In many cases the result could not be ascertained, yet the proportion of undetermined cases, as indicated by the aggregates in the tables, was much smaller than could have reasonably been anticipated.* In the earlier part of the work, the number of histories, and especially of very brief histories, that are printed, may appear unnecessarily large; but it was desired to give some insight into the method by which cases were traced and followed to their termination, with the hope that the reader, on being assured that many of these brief memoranda presented a digest of the results of a search through half a dozen reports, perhaps, and that the cases represented numerically only had undergone precisely similar investigation, would entertain a reasonable confidence in the accuracy of the statistical conclusions. In the later portions of the work, the typical cases are more elaborated and fewer are selected to be printed in full. In stating in the abstracts that a case is reported by a medical officer whose name is given, it is not designed to intimate that he is responsible for the language employed. Very possibly some details are taken from several field or hospital reports or registers, each supplying some facts omitted in the others. It is simply designed to ascribe whatever merit belongs to the abstract to the surgeon giving the fullest account, or to give the history the authority of his name. Wherever the surgeon's own language is employed quotation marks are used, and whenever complete histories have been furnished by a single observer, they have been preferred, and printed in the reporter's own words. The classification adopted has rendered it necessary to encounter first in order the most obscure and complicated subjects, and the writer has been keenly sensible of the difficulties involved in this arrangement. On wounds of the extremities, on amputations, excisions, and conservative measures in fractures and wounds of joints, and almost all matters demanding prompt active interference, the materials at his disposition have been very extensive, and the means of illustration almost unlimited; for the army surgeons showed great diligence in preserving statistical details on these

* In computing percentages, the undetermined cases are not included.

subjects, and freely expressed their opinions on the relative merits of different methods of treatment, while admirable drawings and specimens of recent injuries were early secured, and preparations showing their progress and results were largely accumulated. On wounds of the trunk, the materials were also abundant; but the obstacles to satisfactory analysis and exposition were great. Generally, the medical officers were very concise in reporting on wounds of the head, of the chest, and of the abdomen, often failing to record all important points of professional interest, and commonly refraining from critical discussion or comment. It was not easy to obtain good pictorial representations of these injuries, their progress and results.* Whether the obscurity attending them, or the comparative inadequacy of therapeutical resources against them, renders them less attractive to surgeons, it is certain that less real reliable information relating to them is to be found than in regard to those in which brilliant operative dexterity may be displayed. In regard to injuries of the head,† it may be that writers are deterred from enlarging on them by doubt of their ability to add to the knowledge imparted by the great teachers of the past; but the conditions the elder authors had in view were not identical with those observed by the moderns, and the latter cannot be exonerated from the duty of collecting facts with which to judge the conflicting views of their predecessors, or of applying to these difficult problems the more refined means of investigation that the advances of science have placed at their command. The obscurity which attends wounds of the head, and renders their pathology so ambiguous, does not, as Hennen observes, exist in an equal degree in those of the thorax; yet Dr. Fraser, inpreparing his monograph on the subject, was able to find but one treatise especially devoted to penetrating wounds of the chest, that by Dr. Mayer, of St. Petersburg.‡ As to wounds of the abdomen, it may be that their extreme fatality and brevity of the period through which, commonly, they remain under observation, deprive them of the interest with which they would otherwise be regarded; for, as Sir Charles Bell has remarked, although wounds of the belly are common enough immediately after a battle, bearing a fair relative proportion to other wounds, yet a few days suffice to remove them, so that, by the end of the first week, there is scarcely one to be seen.

That the experience acquired during the war should have added largely to every subject connected with military surgery was not to be anticipated. But it may be safely asserted that, in many directions, it has advanced the boundaries of our knowledge. Even in the very difficult field of investigation presented by the wounds and injuries of the

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*The gifted artist, Mr. STAUCH, whose services Surgeon Brinton had fortunately secured, after preparing many water-color drawings of recent injuries, at the field hospitals, died from pernicious fever contracted before Petersburg, without completing the exquisite studies of embolism, cranial abscess, false aneurism, osteomyelitis, and gangrene, which he had drawn from dissections made at the Museum.

†"Injuries of the head affecting the brain are difficult of distinction, doubtful in character, treacherous in their course, and, for the most part, fatal in their results. The symptoms which appear especially to indicate one kind of accident are frequently prevalent in another. It may be even said that there is no one symptom which is presumed to demonstrate a particular lesion of the brain, which has not been shown to have taken place in another of a different kind. Examination after death has often proved the existence of a most serious injury, which had not been suspected; and death has not unfrequently ensued immediately, or shortly after the most marked and alarming symptoms, without any adequate cause for the event being discovered on dissection. Such are the deficiences in our knowledge of the complicated functions of the brain, that although we think we can occasionally point out where the derangement of structure will be found, which has given rise to a particular symptom during life, the very next case may probably show an apparently sound structure with the same derangement of function. One man shall lose a considerable portion of his brain without its being productive at the moment, or even after his restoration to health, of the slightest apparent functional inconvenience; whilst another shall fall and shortly die without an effort at recovery, in spite of any treatment which may be bestowed upon him, after a very much slighter injury inflicted apparently on the same part."—GUTHRIE, *on Injuries of the Head affecting the Brain*, 4to, London, 1842. "Of all the accidents met with in field practice, these are, beyond doubt, the most serious, both directly and remotely—the most confusing in their manifestions, and the least determined in their treatment, although they have engaged the attention of the master minds of all ages and countries from the time of the old surgeon of Cos down to the present day."—MACLEOD, Notes, etc. (*op. cit.*, p. 175).

‡Dr. Fraser justly remarks (*op. cit.*, p. 2) that "while Army surgeons have displayed great care and attention on matters relating to statistics; while they have laboriously discussed the relative merits of excisions and disarticulations, and have displayed consummate skill in the treatment of wounds of the joints and extremities,—in a word, on all matters which demand active, and 'truth must out' showy manual ability, the less attractive, because more obscure, but not the less important subject of wounds of the head, chest, and abdomen, appears to have elicited only passing and imperfect notice."

head, we have learned something. Surgeons have been schooled to deal with the most ghastly injuries of the face without dismay, to obtain unexpected results, and to accomplish favorably reparative operations from which, formerly, they would have recoiled; and they have been taught the futility of tying the great arterial trunks of the neck for hæmorrhage from face-wounds. The true principles of treatment of wounded arteries in the neck is now generally understood; and while, before the war, there were few surgeons who chose to undertake operations on the great vessels, there are now thousands who know well when and how a great artery shall be tied. Our information respecting injuries of the vertebral column has been augmented; and, passing to the wounds of the chest, we find a complete revolution in theory and practice. Without further illustration, we may claim that the additions to surgical knowledge acquired in the war are of real and practical value. On those topics in which the materials at his disposition merely corroborated or confirmed views already generally entertained, the editor has sought to be concise, and to enlarge on those subjects to which some material addition to our knowledge has been brought by the observations made during the war, either because of novelties in nature or in treatment, or through the large number of rare or of analogous cases permitting the occasional presentation of crucial instances, and the more frequent application of the theories of averages and of probabilities.* Though the labor upon matters of detail, inseparable from carrying out instructions to regard the "preservation of the great mass of facts collected, in a form for convenient study," as the chief object in view, has generally confined the editor's attention to the arrangement and grouping and illustration of the observations, he has sought, whenever time and opportunity permitted, to facilitate the student's enquiries by analyses, and summaries, and references to the surgical results of other wars, without abstaining from critical comments; but censuring bad practice, intending no discourtesy to individuals, nor violation of the *homines amare, errores immolare* precept of St. Augustine. The learned historian of the inductive sciences has not included pathology and therapeutics in his outline, and we must perhaps be content to wait until some genius as sublime as Newton's shall explain the laws of life by a generalization as simple and perfect as the law of gravitation, before the physiological sciences shall be recognized among the strictly exact sciences. But, meanwhile, the tendency among surgeons to seek to establish, by inductive methods, at least those less general and more complicated rules to which the name of "empirical laws" has been given, cannot be gainsayed.† Though unable yet to aim at establishing laws of cause and effect, they are constantly seeking to determine by statistical calculation the influence exerted by different modes of practice, and thus to open the way for framing inductions; and as these less general relations require a very much larger number of cases than are needed to establish laws of causation, they continually resort to the numerical method. This is peculiarly applicable to military surgery; for some of the variable circumstances which contribute to

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* LA PLACE, *Essai philosophique sur le calcul des probabilités*, page 220, says that the mathematical theory of probabilities is, fundamentally, only "*le bon sens réduit au calcul.* It has so often been misapplied in medical enquiries, that PEISSE (*La Médecine et les Médecins*, Paris, 1857, Vol. I, p. 175) profanely suggests that the inverse operation might often be profitably instituted, and "cyphering put in accord with common sense."

† *Ars tota in observationibus*, said an ancient master. Those who deride the numerical method as an absurd caricature of the inductive or experimental method in philosophy, say that *in observatione* would be better, and censure the unfortunate plural, as having promoted the introduction of the statistical system into the medical enquiries. MORGAGNI'S famous *Non numerandæ sed perpendendæ sunt observationes* is often cited against the numerists; but those who do not relish so formidable an adversary may, with Bouillaud (*Essai sur la philosophie médicale*, Paris, 1836, p. 186), write the aphorism: *Non* SOLUM *numerandæ* SED ETIAM *perpendendæ sunt observationes.* For more serious observations on this most important subject, consult: GAVARRET, *Principes générales de Statistique Médicale*; LAYCOCK, *Medical Observation and Research*; GUY, *On the best Method of collecting and arranging Facts*, in Jour. of Stat. Soc. of London, Vol. III; BARCLAY, *Medical Errors*, London, 1864, TODD, *The Book of Analysis*; QUETETET, *Sur l'homme.*

the production or modification of the result, and which cannot well be eliminated from ordinary statistics, are here excluded—for example, sex, age, and bodily vigor, within certain limits—while there is comparative uniformity in the external circumstances of food, air, nursing, and attendance. The simple rehearsal of cases would be a very profitless addition to our knowledge, unless, through their agency, we sought for analogies and relations that may establish rules of practice.

The surgical lessons of the war, like its other good results, were only obtained at the expense of great sacrifices. The army surgeon is not only exposed to the dangers arising from excessive fatigue, and constant contact with disease, but to the fatalities directly incident to war. I have not the names of the numerous Confederate medical officers whose devotion to duty cost their lives, nor space for the long list of Union surgeons who perished from diseases strictly consequent upon the nature of their avocations, but will, at least, record the names of the latter who fell in battle. The following officers of the medical staff of the regular and volunteer forces of the Union Army were killed in action:

Surgeon SAMUEL EVERETT, U. S. V., at Shiloh, April 6th, 1862.
Surgeon W. J. H. WHITE, U. S. A., at Antietam, September 17th, 1862, while placing the field hospitals of the Sixth Corps, of which he was medical director. (*See* APPENDIX, p. 100.)
Assistant Surgeon A. A. KENDALL, 12th Massachusetts Volunteers, at Antietam, September 17th, 1862. (*See* APPENDIX, p. 100.)
Assistant Surgeon EDWARD H. R. REVERE, 20th Massachusetts Volunteers, at Antietam, September 17th, 1862. (*See* APPENDIX, p. 100.)
Surgeon J. D. S. HASLETT, 59th Illinois Volunteers, at Perryville, October 8th, 1862.
Surgeon J. FOSTER HAVEN, 15th Massachusetts Volunteers, at Fredericksburg, December 13th, 1862. (*See* APPENDIX, p. 104.)
Assistant Surgeon JOHN HURLEY, 69th New York Volunteers, April 15th, 1863.
Surgeon CHARLES A. HARTMAN, 107th Ohio Volunteers, at Chancellorsville, May 2d, 1863.
Acting Assistant Surgeon A. HICHBORN, at Chancellorsville, May 3d, 1863.
Surgeon E. L. WATSON, 1st California Volunteers, near Fort Craig, New Mexico, July 19th, 1863.
Surgeon J. S. WEISER, 1st Minnesota Cavalry, near Big Mound, Dakota Territory, in a fight with Sioux Indians, July 24th, 1863.
Surgeon THOMAS JONES, 8th Pennsylvania Reserves, at Spottsylvania, May 14th, 1864.
Surgeon H. S. POTTER, 105th Illinois Volunteers, near Ackworth, Georgia, June 2d, 1864. (*See* APPENDIX, p. 308.)
Assistant Surgeon A. S. FRENCH, 114th Illinois Volunteers, at Guntown, June 10th, 1864.
Surgeon L. B. SMITH, 7th Minnesota Volunteers, at Tupelo, Mississippi, July 13th, 1864.
Surgeon J. C. STODDARD, 56th U. S. Colored Troops, Wallace's Ferry, Arkansas, July 26th, 1864.
Surgeon CHARLES J. LEE, 11th United States Colored Troops, near Fort Smith, Arkansas, August 24th, 1864.
Surgeon W. H. RULISON, 9th New York Cavalry, medical director of the cavalry of the Middle Military Division, at Smithfield, Virginia, August 29th, 1864. (*See* APPENDIX, p. 226.)
Assistant Surgeon FREDERICK WAGNER, 3d Tennessee Cavalry, at Sulphur Branch Trestle, Alabama, September 25th, 1864.

The following officers of the medical staff, while in the discharge of their duty, were killed by partizan troops or assassinated by guerrillas or rioters:

Surgeon H. N. GREGORY, 1st Wisconsin Cavalry, June 9th, 1862.
Assistant Surgeon F. L. HUNT, 27th Massachusetts Volunteers, November 18th, 1862.
Assistant Surgeon JARED FREE, 83d Pennsylvania Volunteers, December 10th, 1863.
Surgeon SHUBALL YORK, 54th Illinois Volunteers, Charleston, Illinois, March 28th, 1864.
Assistant Surgeon S. A. FAIRCHILD, 6th Kansas Cavalry, Stone's Farm, April 6th, 1864.
Assistant Surgeon J. A. JONES, 115th Illinois Volunteers, July 9th, 1864.
Assistant Surgeon ELI M. HEWITT, 15th U. S. Colored Troops, July 24th, 1864.
Surgeon J. B. MOORE, 5th Tennessee Cavalry, September 5th, 1864.
Acting Assistant Surgeon F. M. OSBORNE, September 22d, 1864.
Surgeon J. B. COOVER, 6th Pennsylvania Cavalry, September 27, 1864. (*See* APPENDIX, p. 226.)
Assistant Surgeon JOHN B. PORTER, 89th Indiana Volunteers, November 1st, 1864.
Surgeon J. L. SHERK, 7th Pennsylvania Cavalry, at Bardstown, Kentucky, December 29th, 1864.
Acting Assistant Surgeon SAMUEL FAHNESTOCK, April 13th, 1864.

The following medical officers died of wounds received in action:

Assistant Surgeon S. ALEXANDER, 1st Pennsylvania Cavalry, died November 29th, of wounds received at Drainesville, Virginia, on November 26th, 1861.

Assistant Surgeon J. E. HILL, 19th Massachusetts Volunteers, died of wounds received at Fairfax, Virginia, on September 11th, 1862.

Assistant Surgeon W. S. MOORE, 61st Ohio Volunteers, died of wounds received at Gettysburg on July 2d, 1863.

Acting Assistant Surgeon W. B. CARY, died of wounds on January 20th, 1864.

Assistant Surgeon HEZEKIAH FISH, 15th Iowa Volunteers, died August 19th, of wounds received near Atlanta on August 17th, 1864.

Surgeon OTTO SCHENK, 46th New York Volunteers, died on August 21st, 1864, of wounds received near Petersburg, August 20th, 1864. (*See* APPENDIX, p. 175.)

Acting Assistant Surgeon EMIL OHLENSCHLAGER, died October 8th, of wounds received in action on October 8th, 1864. (*See* APPENDIX, p. 226.)

Surgeon THOMAS J. SHANNON, 116th Ohio Volunteers, died October 20th, of wounds received at Cedar Creek on October 19th, 1864. (*See* APPENDIX, p. 226.)

The following medical officers died through accidents occurring in the line of duty:

Surgeon FREDERICK S. WELLS, 9th New Jersey Volunteers, drowned at Hatteras Inlet, January 15th, 1862, in the courageous and perilous attempt to land to procure food and water for the famine-stricken regiment, its transport being driven off shore in a terrific storm.

Assistant Surgeon W. M. KNOX, 78th Pennsylvania Volunteers, April 27th, 1862.

Assistant Surgeon JESSE J. THOMAS, 10th New Jersey Volunteers, May, 1862.

Assistant Surgeon CHARLES JOHNSON, 10th Tennessee Volunteers, killed by a fall, April 5, 1863.

Surgeon GEORGE HAMMOND, U. S. A., drowned in the Mississippi River, August 14th, 1863.

Assistant Surgeon W. B. WITT, 69th Indiana Volunteers, drowned at Saluria Bayou, Texas, March 13th, 1864.

Assistant Surgeon S. C. FERSON, 74th Illinois Volunteers, at Varnell, October 7, 1864.

Surgeon WILLIAM K. SADLER, 19th Kentucky Volunteers, shot by a soldier, December 2d, 1864.

Assistant Surgeon A. F. MARSH, 56th Illinois Volunteers, lost at sea, on the steamer *General Lyon*, March 31st, 1865.

If the above sad mortuary record, proportionately larger than that of any other staff corps, is insufficient to correct the popular fallacy that, in time of battle, the post of the medical officer is one of comparative safety, that false impression may be removed by the following list of medical officers wounded in action:

Surgeon J. MARCUS RICE, 25th Massachusetts Volunteers, at Roanoke Island, February 7th, 1862.
Acting Assistant Surgeon W. A. KITTREDGE, Fort Fillmore, New Mexico, June 25th, 1862. (*See* APPENDIX, p. 353.)
Surgeon A. A. EDMESTON, 92d New York Volunteers, at Savage's Station, June 27th, 1862.
Assistant Surgeon G. M. MCGILL, U. S. A., at Beverly Ford, Virginia, October 22d, 1863.
Assistant Surgeon W. M. NOTSON, U. S. A., at Gettysburg, July 3d, 1863.
Surgeon J. M. STEVENSON, 3d Maryland Cavalry, at Gettysburg, July 3d, 1863.
Surgeon CHARLES ALEXANDER, 16th Maine Volunteers, at Gettysburg, July 2d, 1863.
Assistant Surgeon E. B. HECKEL, 27th Pennsylvania Volunteers, at Gettysburg, July 3d, 1863.
Assistant Surgeon JOSEPH D. STEWART, 74th New York Volunteers, Gettysburg, July 2d, 1863.
Surgeon F. H. GROSS, U. S. V., at Chickamauga, September 19th, 1863. (*See* APPENDIX, p. 270.)
Surgeon J. R. WEIST, 4th Ohio Cavalry, wounded in 1863.
Assistant Surgeon A. H. LANDIS, 35th Ohio Volunteers, at Chickamauga, September 19th, 1863.
Surgeon E. A. MERRIFIELD, 44th Illinois Volunteers, at Chickamauga, September 19th, 1863. (*See* APPENDIX, p. 277.)
Assistant Surgeon W. H. FORWOOD, U. S. A., at Brandy Station, October 8th, 1863.
Surgeon N. R. DERBY, U. S. V., on Cane River, Louisiana, April 21st, 1864. Permanently maimed and pensioned.
Assistant Surgeon ROBERT FENWICK, 146th New York Volunteers, by a shell fragment, at the Wilderness, May 8th, 1864.
Surgeon T. E. MITCHELL, at Winchester, May 25th, 1861. (*See* APPENDIX, p. 230.)
Assistant Surgeon W. A. BARRY, 98th Pennsylvania Volunteers, Wilderness, May 6th, 1864.
Assistant Surgeon R. S. VICKERY, 2d Michigan Volunteers, Petersburg, July 30th, 1864. Femoral artery ligated.
Assistant Surgeon ISAAC SMITH, 26th Massachusetts Volunteers, at Opequan, September 19th, 1864. He is a pensioner. (*See* APPENDIX, p. 226.)
Surgeon JOHN T. SCEARCE, 11th Indiana Volunteers, at Cedar Creek, October 19th, 1864. (*See* APPENDIX, p. 226.
Assistant Surgeon PRESTON B. ROSE, 5th Michigan Volunteers, Hatcher's Run, October 27th, 1864 He is a pensioner.
Assistant Surgeon C. C. V. A. CRAWFORD, 102d Pennsylvania Volunteers, Petersburg, July 12th, 1864.
Assistant Surgeon THOMAS HELM, 148th New York Volunteers, Petersburg, September, 1864.
Assistant Surgeon AUSTIN MANDEVILLE, 169th New York Volunteers, Dutch Gap, August 13th, 1864. He is a pensioner.
Assistant Surgeon D. W. RICHARDS, 145th Pennsylvania Volunteers, June 2d, 1864.
Surgeon W. A. SMITH, 103d New York Volunteers, Suffolk, May 3d, 1863. He is a pensioner.
Assistant Surgeon SAMUEL B. SHEPARD, 7th Connecticut Volunteers, captured, June 2d, 1864.
Surgeon ISAAC WALBURN, 17th Pennsylvania Cavalry, at Beverly Ford, June 9th, 1863.
Assistant Surgeon H. T. WHITMAN, 5th Pennsylvania Volunteers, at Bethesda Church, Virginia, May 30th, 1864.
Assistant Surgeon L. BARNES, 6th United States Colored Troops, explosion of magazine at Fort Fisher, January 16th, 1865.
Surgeon M. M. MANLY, 2d United States Colored Troops, at Fort Darling, Virginia, May 14th, 1864.
Assistant Surgeon G. V. R. MERRILL, 6th United States Colored Troops, at Petersburg, June, 1864.

Acting Assistant Surgeon SAMUEL H. BOONE, January 17th, 1865.
Surgeon J. T. STEWART, 64th Illinois Volunteers, Atlanta, July 19th, 1864.
Assistant Surgeon A. G. PICKET, 50th Illinois Volunteers, at Allatoona, October 5th, 1864.
Surgeon A. N. DOUGHERTY, U. S. V., Wilderness, May 6th, 1864.
Assistant Surgeon JAMES ALLEN, 89th New York Volunteers, Petersburg, September, 1864.
Assistant Surgeon O. H. ADAMS, 8th New York Cavalry, at Lacy's Springs, December 21st, 1864. (*See* SURG. HIST. p. 2.)
Assistant Surgeon JACOB C. BARR, 1st Ohio Volunteers, Wauhatchie, Tennessee, October 29th, 1864.
Assistant Surgeon JULIUS BRAY, 25th Missouri Volunteers, at Shiloh, April 6th, 1862.
Assistant Surgeon JAMES BROWN, 4th Tennessee Cavalry, Franklin, Tennessee, September 23d, 1864.
Assistant Surgeon G. B. BAILEY, 9th West Virginia Cavalry, at Guyandotte, November 10th, 1861.
Assistant Surgeon CHARLES BUNCE, 59th Illinois Volunteers, July, 1864.
Assistant Surgeon A. T. C. CONNER, 9th New York Cavalry, Woodville, Virginia, May, 1864.
Assistant Surgeon D. O. CROUCH, 13th Pennsylvania Reserves, Fredericksburg, December 13th, 1862.
Surgeon J. W. GREEN, 95th Illinois Volunteers, Spanish Fort, Alabama, April 8th, 1865.
Assistant Surgeon T. GILFILLAN, 59th Massachusetts Volunteers, Petersburg, July 8th, 1864.
Assistant Surgeon JOSEPH GARDNER, 24th Kentucky Volunteers, near Atlanta, August 5th, 1864. He is a pensioner.
Assistant Surgeon C. E. GOLDSBOROUGH, 5th Maryland Volunteers, Petersburg, August 5th, 1864.
Acting Assistant Surgeon RALPH C. HUSE, January 16th, 1865.
Assistant Surgeon LEVI JEWETT, 14th Connecticut Volunteers, Reams Station, August 28, 1864. (*See* APPENDIX, p. 173.)
Assistant Surgeon DAVID D. KENNEDY, 57th Pennsylvania Volunteers, Fredericksburg, December 13th, 1862.
Surgeon JAMES A. MORRIS, 117th New York Volunteers, Fort Fisher, January 16th, 1865.
Assistant Surgeon EDWIN W. MAGANN, 9th Indiana Cavalry, Sulphur Branch Trestle, Alabama, September 25th, 1864.
Assistant Surgeon THOMAS L. MORGAN, 10th Missouri Volunteers, April, 1864.
Assistant Surgeon PETER M. MURPHY, 134th New York Volunteers, Resaca, Georgia, May 15th, 1864.
Assistant Surgeon GEORGE A. MUNROE, 3d Rhode Island Cavalry, on a scout, November 29th, 1864.
Surgeon CHARLES NEWHAUS, 29th New York Volunteers, second Bull Run, August 29th, 1862. He is a pensioner.
Surgeon WILLIAM D. NEWELL, 28th New Jersey Volunteers, Fredericksburg, December 13th, 1862.
Surgeon FOWLER PRENTICE, 73d New York Volunteers, August, 1864.
Surgeon HENRY ROOT, 58th New York Volunteers, May, 1863.
Surgeon PETER E. SICKLER, 8th New York Cavalry, Petersburg, April, 1865.
Assistant Surgeon GEORGE R. SULLIVAN, 15th New Jersey Volunteers, Fredericksburg, May 9th, 1863.
Assistant Surgeon THOMAS S. STANWAY, 102d Illinois Volunteers, Nashville, December 22d, 1863.
Surgeon WILLIAM P. THURSTON, 1st Rhode Island Artillery, Fairfax, June 28th, 1862.
Surgeon JAMES WILSON, 99th New York Volunteers, Suffolk, April 24th, 1863.
Surgeon A. A. C. WILLIAMS, Second United States Sharpshooters, Chancellorsville, May 3d, 1863.
Surgeon ARVIN F. WHELAN, 1st Michigan Sharpshooters, Petersburg, August 3d, 1864.
Assistant Surgeon CHARLES A. WHEELER, 12th Massachusetts Volunteers, Wilderness, May 6th, 1864.
Assistant Surgeon T. W. C. WILLIAMSON, 24th Indiana Volunteers, Champion Hills, May 16th, 1863.
Assistant Surgeon J. S. WAGGONER, 84th Pennsylvania Volunteers, in May, 1863.
Surgeon JOHN DICKSON, 111th United States Colored Troops, at Sulphur Branch Trestle, Alabama, September 25th, 1864.

I had hoped to complete, in this first part of the Surgical History of the War, the discussion of the Wounds and Injuries of the Head and Trunk. But the preliminary matter that has been included occupies so much space, that it is necessary to reserve many of the general observations upon the Injuries of the Head, Spine, and Blood-vessels, and the consideration of Wounds and Injuries of the Abdomen and of the Pelvis, and to place the latter at the commencement of the succeeding surgical volume.

GEORGE A. OTIS.

A. M. M.

CHRONOLOGICAL SUMMARY

OF

ENGAGEMENTS AND BATTLES.

CHRONOLOGICAL SUMMARY OF THE ENGAGEMENTS AND BATTLES.

DATE. 1861.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
April 12th and 13th.	Fort Sumter, South Carolina	Battery E, 1st U. S. Artillery	.....	.....	.....	.....	.....	.....	There were no casualties during the bombardment; but, in saluting the flag, before the evacuation, on April 15th, Private Daniel Hough was killed and three other artillerists were wounded by the premature explosion of a gun.
April 19th.	Streets of Baltimore, Maryland	6th Massachusetts State Militia and 26th Pennsylvania Volunteers.	4	30	.....	9	.....	.....	Casualty Lists, S. G. O., No. 555.
April 18th.	Harper's Ferry, Virginia	Detachment of Ordnance men	.....	.....	6	.....	.....	.....	Official Report of Lieutenant R. Jones.
May 10th ..	Camp Jackson, Missouri	1st, 3d, and 4th Mo. Reserve Corps and 3d Missouri Vols.	.....	.....	.....	.....	.....	639	Official Report of Capt. Nathaniel Lyon, 2d Infantry.
May 10th ..	St. Louis, Missouri, corner of 5th and Walnut streets.	5th Missouri U. S. Reserve Corps	4	.....	.....	27	.....	.....	Report of Adjutant General of Missouri, 1865, p. 79.
June 1st...	Fairfax Court-house, Virginia	Company B, 2d U. S. Cavalry	1	4	1	1	14	5	Official Report of Lieut. C. H. Tompkins for the Union losses. Confederate report of Confed. losses.
June 3d ...	Phillippi, West Virginia	1st West Virginia, 16th Ohio, 7th Indiana, 9th Indiana, and 14th Ohio Volunteers.	.....	2	2	.....	16	10	Official Report.
June 10th..	Great Bethel, Virginia	1st, 2d, 3d, 5th, and 7th New York Vols., 4th Massachusetts, and a detachment of 2d U. S. Artillery.	16	34	6	1	7	.....	Casualty Lists, S. G. O., File A. 555, and Official Report of Major General B. F. Butler, U. S. V. Lieut. Greble, 2d Artillery, killed.
June 11th..	Romney, West Virginia	11th Indiana Volunteers	.....	1	.....	2	1	.....	Indiana Adjutant General's Report, Vol. 1, p. 31.
June 17th..	Vienna, Virginia	1st Ohio Volunteers	5	6	10	6	.....	.....	Official Report of Brigadier General R. C. Schenck, U. S. V.
June 17th..	Boonville, Missouri	2d Missouri (three months) Volunteers, Batteries H and L, 1st Missouri Light Artillery.	2	19	20	15	20	15	Missouri Adjutant General's Report, 1865, p. 405.
June 17th..	Edward's Ferry, Virginia	1st Pennsylvania Volunteers (300 men)	1	4	.....	.....	15	.....	Sundry unofficial reports.
June 17th..	Independence, Missouri	Detachment of Missouri Volunteers	.....	.....	.....	.....	.....	.....	Unofficial reports.
June 17th..	New Creek, West Virginia	Local Militia	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. II, page 3.
June 18th..	Camp Cole, Missouri	Union Home Guards (800 men)	15 25	20 52	30 23	4	20	30	Sundry unofficial reports.
June 26th..	Patterson Creek, Virginia	11th Indiana Volunteers	1	1	.....	7	2	.....	Indiana Adjutant General's Report, Vol. 2, p. 31. Casualty Lists, S. G. O., File A, No. 155. Also designated Kelly's Island.
June 27th..	Mathias Point, Virginia	Crews of U. S. Gunboats Pawnee and Freeborn	1	4	.....	.....	.....	.....	Official Report of Captain T. C. Rowan, U. S. N. Commander T. H. Ward, U. S. N., was killed.
July 2d....	Falling Waters, Maryland	1st Wisconsin and 11th Pennsylvania Volunteers. Advance of Brigadier General George H. Thomas's command.	8	15	.....	31	50	10	Appendix to Part I, of the Medical and Surgical History of the War, p. 10. This engagement is also designated Haynesville and Martinsburg.
July 5th...	Carthage, Missouri	3d and 5th Missouri (three months) and Battery of Missouri Artillery.	13	31	.....	30	125	45	Casualty Lists, S. G. O., No. 209, and Official Report of Colonel Franz Siegel, 3d Missouri Volunteers. Also designated Dry Forks.
July 5th...	Newport News, Virginia	9th New York (one company)	.....	6	.....	.....	3	.....	Newspaper report.

July 6th...	Middle Creek Fork, West Virginia.....	3d Ohio Volunteers (one company).....	1	6	.....	7	.....	.....	Casualty Lists, S. G. O., No. 555, and Ohio in the War, Vol. 2, p. 28. Also known as the action at Buckhannon.
July 7th...	Great Falls, Virginia.....	8th New York Volunteers	2	.....	.....	12	.....	.....	Rebellion Record, Vol. II, page 21.
July 8th...	Laurel Hill, West Virginia.....	14th Ohio and 9th Indiana Volunteers	2	6	.....	.....	.....	.....	Also designated Bealington.
July 10th..	Monroe Station, Missouri	16th Illinois and 3d Iowa Volunteers and Hannibal Home Guards.	3	.....	.....	4	20	75	Adjutant General's Report, Illinois, Vol. 1, p. 417.
July 11th..	Rich Mountain, West Virginia.....	8th, 10th, and 13th Indiana and 19th Ohio Volunteers...	11	35	.....	60	140	100	See Appendix to Part I of the Medical and Surgical History of the War, page 13; Report of Medical Director J. J. B. Wright, U. S. A.; also Official Report of Major General George B. McClellan, U. S. V.
July 12th..	Barboursville, West Virginia.....	2d Kentucky Volunteers.....	1	.....	.....	10	.....	.....	Also designated Red House.
July 12th..	Beverly, West Virginia	4th and 9th Ohio Volunteers	.....	.....	.....	.....	.....	600	Official Report of General McClellan.
July 14th..	Carrick's Ford, West Virginia	14th Ohio and 9th and 7th Indiana Volunteers	13	40	.....	20	10	50	See Appendix to Part I, Medical and Surgical History of the War, page 14. Confederate General R. S. Garnett killed.
July 16th.	Millsville, Missouri, North Missouri Railroad.	8th Missouri Volunteers	7	1	7	7	.....	.....	Missouri Adjutant General's Report, 1865, p. 128. Also designated Wentzville.
July 17th..	Fulton, Missouri	3d Missouri Reserves (400 men).....	1	15	.....	.....	.....	.....	Tribune Almanac, 1862, page 44, and Report of Adjutant General of Missouri, 1865, page 74.
July 17th..	Scarytown, West Virginia.....	2d Kentucky, 13th and 21st Ohio Vols. and 1st Ohio Bat'y.	9	38	9	.....	.....	.....	Ohio in the War. Vol. 2, p. 89.
July 17th..	Martinsburg, Missouri.....	1st Missouri Reserves (one company).....	1	1	.....	.....	.....	.....	Official Report of Adjutant General of Missouri, 1865.
July 17th..	Bunker Hill, Virginia.....	Detachment of General Patterson's command.....	.....	.....	.....	4	.....	5	
July 18th and 19th.	Harrisonville and Parkersville, Missouri.	Van Horn's Battalion, (Mo.,) Cass County Home Guards.	1	.....	.....	14	.....	.....	Report of Adjutant General of Missouri, 1865, page 91.
July 18th..	Blackburn's Ford, Virginia.....	1st Massachusetts, 2d and 3d Michigan, and 12th New York Volunteers, detachment of 2d U. S. Cavalry, and Battery E, 3d U. S. Artillery.	19	38	26	15	53	.....	Official Reports of Generals McDowell and Beauregard.
July 21st..	Bull Run, Virginia.....	Of infantry volunteers or militia, the 2d Maine, 2d New Hampshire, 2d Vermont, 1st, 4th, and 5th Massachusetts, 1st and 2d Rhode Island, 1st, 2d, and 3d Connecticut, 8th, 11th, 12th, 13th, 16th, 18th, 27th, 29th, 31st, 32d, 35th, 38th, and 39th New York Volunteers, 2d, 8th, 14th, 69th, 71st, and 79th New York Militia, 27th Pennsylvania Volunteers, 1st, 2d, and 3d Michigan, 1st Minnesota, 1st and 2d Ohio, 2d Minnesota, and detachments of the 2d, 3d, and 8th Regular Infantry and a battalion of Marines; of artillery, batteries D, E, G, and M, 2d Artillery, E, 3d Artillery, D, 5th Artillery, and the 2d Rhode Island Battery; of cavalry, detachments from the 1st and 2d Dragoons.	481	1,011	1,460	269	1,483	.....	Official Reports of Generals McDowell and Beauregard. Appendix to Part 1, Medical and Surgical History of the War, pages 1 to 10 inclusive; MSS. Confederate casualty lists. This battle is also designated Manassas. Among the Confederate killed were Brigadier Generals B. E. Bee and Barton.
July 22d...	Forsyth, Missouri.....	1st Iowa and 2d Kansas Volunteers, Stanley Dragoons, and Totten's Battery.	.....	3	.....	5	10	.....	Unofficial sources.
July 22d...	Etna, Missouri	21st Missouri Volunteers.....	.....	.....	.....	.....	.....	.....	Official Report of the Adjutant General of Missouri, for 1865.
July 24th..	Blue Mills, Missouri	5th Missouri Reserves.....	1	12	.....	.....	.....	.....	Same Report.
July 26th .	Lane's Prairie, near Rolla, Missouri.....	Home Guards	.....	3	.....	1	3	3	Unofficial.
July 26th..	Harrisonville, Missouri.....	Missouri Home Guards and 5th Kansas Cavalry	.....	.....	.....	.....	.....	.....	Official.
July 27th..	Fort Fillmore, New Mexico	7th U. S. Infantry and U. S. Mounted Rifles	.....	.....	426	.....	.....	.....	

DATE. 1861.	LOCALITY.	UNION TROOPS ENGAGED	UNION LOSS. Killed.	Wounded.	Missing.	CONFED. LOSS. Killed.	Wounded.	Missing.	REMARKS AND REFERENCES.
Aug. 2d...	Dug Springs, Missouri	1st Iowa and 3d Missouri Volunteers, and five batteries Missouri Light Artillery.	4	37	.....	40	44	16	Appendix to Part I, Medical and Surgical History of the War, page 15.
Aug. 3d...	Mesilla, New Mexico	7th U. S. Infantry and U. S. Mounted Rifles	3	6	.....	12	.....	.....	Unofficial sources.
Aug. 5th...	Athens, Missouri	Home Guards and 21st Missouri Volunteers	3	8	.....	14	14	.....	Rebellion Record, Vol. II, page 463.
Aug. 5th...	Point of Rocks, Maryland	28th New York Volunteers	.....	.....	.....	3	2	7	Unofficial.
Aug. 7th...	Hampton, Virginia	20th New York Volunteers	.....	.....	.....	3	6	.....	Unofficial statement.
Aug. 8th...	Lovettsville, Virginia	19th New York Volunteers	.....	.....	.....	1	5	.....	New York Times, August 13th, 1861.
Aug. 10th..	Wilson's Creek, Missouri	Cavalry: 6th and 10th Missouri, 2d Kansas Mounted Volunteers, and one company of the 1st United States. Infantry: 1st Iowa, 1st Kansas, 1st, 2d, 3d, and 5th Missouri, detachments of the 1st and 2d Regulars, Missouri Home Guards. Artillery: 1st Missouri Light, and Battery F, 2d United States. Commanded by Brigadier General Nathaniel Lyons.	223	721	291	265	800	30	Official Report of Major General Frémont. Appendix Medical and Surgical History of the War, Part 1, pages 16, 17. Also known as Springfield and Oak Hills. Brigadier General Nathaniel Lyons was killed.
Aug. 10th..	Potosi, Missouri	Missouri Home Guards	1	.....	.....	2	3	.....	Unofficial sources.
Aug. 13th..	Gratton, West Virginia	One company 4th West Virginia Volunteers	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. II, page 65.
Aug. 17th..	Brunswick, Missouri	5th Missouri Reserves	1	7	.....	.....	.....	.....	Report of Adjutant General of Missouri, 1865, page 79.
Aug. 19th..	Charlestown, Missouri	22d Illinois Volunteers	1	6	.....	40	.....	17	Official Report of Major General Frémont. Also known as Bird's Point.
Aug. 20th .	Hawk's Nest, West Virginia	11th Ohio Volunteers	.....	3	.....	1	3	.....	Confederate sources.
Aug. 20th..	Lookout Station, Missouri	.....	1	6	.....	.....	.....	.....	Newspaper statements.
Aug. 21st..	Jonesboro', Missouri	Missouri Home Guards	.....	.....	.....	.....	.....	.....	
Aug. 26th..	Cross Lanes, West Virginia	7th Ohio Volunteers	5	40	200	.....	.....	.....	Ohio in the War, Vol. 2, page 58. Also known as Summerville.
Aug. 27th..	Ball's Cross Roads, Virginia	Two companies 23d New York Volunteers	1	2	.....	.....	.....	.....	Rebellion Record, Vol. III, page 7.
Aug. 27th..	Wayne Court-house, West Virginia	5th West Virginia Volunteers	.....	.....	.....	.....	.....	20	Unofficial.
Aug. 29th..	Lexington, Missouri	Missouri Home Guards	.....	.....	.....	8	.....	.....	St Louis newspapers.
Aug. 28th and 29th.	Fort Hatteras, Cape Hatteras Inlet, North Carolina.	9th, 20th, and 99th New York Volunteers and a naval force commanded by Commodore Stringham.	1	2	.....	5	51	715	*Vide* Official Reports of Major General Butler, U. S. V., and Commodore Stringham, U. S. N.
Aug. 31st..	Munson's Hill, Virginia	Two companies 23d New York Volunteers	2	2	.....	.....	.....	.....	Newspaper statement.
Sept. 1st...	Bennett's Mills, Missouri	Missouri Home Guards	1	8	.....	.....	.....	.....	Unofficial statement.
Sept. 1st...	Boone Court-house, West Virginia	1st Kentucky Volunteers	.....	6	.....	30	.....	40	Appleton's Cyclopedia, 1861, page 741. Adjutant General's Report, Kentucky, Vol. 1, p. 527.
Sept. 2d ..	Dallas, Missouri	11th Missouri Volunteers	2	.....	.....	.....	.....	.....	Report of Adjutant General of Missouri, 1865, page 145.
Sept. 2d...	Worthington, Marion County, West Virginia.	.....	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. III, page 13.

Sept. 2d...	Dry Wood, Missouri	5th and 6th Kansas Volunteers, one company 9th Cavalry, and 1st Kansas Battery.	4	9	1	.....	.....	.....	Official Register of Volunteer Officers, Part VIII. Also known as Fort Scott.
Sept. 2d...	Beher's Mills, Virginia	13th Massachusetts Volunteers	.....	.....	.....	3	5	20	Rebellion Record, Vol. III, page 13.
Sept. 4th...	Shelbina, Missouri	3d Iowa Volunteers	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. III, page 15.
Sept. 7th...	Petersburgh, West Virginia	Three companies of the 4th Ohio Volunteers	.....	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 36.
Sept. 10th..	Carnifex Ferry, West Virginia	9th, 10th, 12th, 13th, 28th, and 47th Ohio Volunteers	16	102	.....	.....	.....	.....	Official Report of Brigadier General Rosecrans. List of casualties, File F, No. 10, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 14.
Sept. 11th .	Lewinsville, Virginia	19th Indiana. 3d Vermont, and 65th New York Volunteers, and 79th New York Militia.	6	8	.....	.....	.....	.....	List of casualties, File F, No. 33, S. G. O.
Sept. 11th..	Elkwater, West Virginia	3d Ohio and 15th and 17th Indiana Volunteers	.....	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, p. 29.
Sept. 12th..	Black River, near Ironton, Missouri	Three companies of the 1st Indiana Cavalry	.....	.....	.....	5	.....	4	Adjutant General's Report, Indiana, Vol. II, p. 278.
Sept. 12th and 13th.	Cheat Mountain, West Virginia	13th, 14th, 15th, and 17th Indiana Volunteers, 3d, 6th, 24th, and 25th Ohio, and 2d West Virginia Volunteers.	9 8	12	60	.....	80	.....	Official Report of General J. J. Reynolds.
Sept. 13th..	Booneville, Missouri	Missouri Home Guards	1	4	.....	12	30	20	Rebellion Record, Vol. III, page 27.
Sept. 14th..	Judah, Rebel privateer, destroyed near Pensacola, Florida.	Crew of United States flag-ship Colorado	3	15	.....	.....	.....	.....	Official Report of Flag Officer W. Mervine.
Sept. 15th..	Pritchard's Mills, Virginia	28th Pennsylvania and 13th Massachusetts Volunteers	1	.....	.....	8	.....	.....	Official Report of Colonel J. W. Geary, 28th Pennsylvania Vols. Also known as Darnestown.
Sept. 12th to 20th.	Lexington, Missouri	8th, 25th, and 27th Missouri Volunteers, 13th and 14th Missouri Home Guards, Berry's and Van Horn's Missouri Cavalry, 1st Illinois Cavalry, and 23d Illinois Volunteers. Colonel James A. Mulligan, 23d Illinois, commanding.	42	108	1,624	25	75	.....	Official Reports of General's Frémont and Price.
Sept. 17th..	Morristown, Missouri	5th, 6th, and 9th Kansas Cavalry and 1st Kansas Battery.	2	6	.....	7	.....	.....	Official.
Sept. 17th..	Blue Mills, Missouri	3d Iowa Volunteers	11	39	6	10	60	.....	Official Report of Lieutenant Colonel John Scott, 3d Iowa Cavalry.
Sept. 18th..	Barboursville, West Virginia	Kentucky Home Guards	1	1	1	7	.....	.....	Unofficial.
Sept. 21st and 22d.	Papinsville, Missouri	5th, 6th, and 9th Kansas Cavalry	17	.....	.....	.....	.....	.....	Official Register of Volunteer Officers. Also designated as Osceola.
Sept. 22d ..	Eliott's Mills, Missouri	7th Iowa Volunteers	1	5	.....	.....	.....	.....	Also designated Camp Crittenden. Iowa Adjutant General's Report, 1864, p. 1057.
Sept. 23d ..	Romney, West Virginia	4th and 8th Ohio Volunteers	3	50	.....	35	.....	.....	Ohio in the War, Vol. 2, pages 36, 66. Also known as Hanging Rock.
Sept. 25th..	Chapmansville, West Virginia	1st Kentucky and 34th Ohio Volunteers	4	9	.....	20	50	47	Ohio in the War, Vol. 2, page 223.
Sept. 26th..	Lucas Bend, Kentucky	Captain Stewart's Cavalry	.....	.....	.....	4	.....	5	Rebellion Record, Vol. III, page 36.
Sept. 27th..	Shanghai, Missouri	.....	.....	.....	.....	.....	.....	.....	Tribune Almanac, 1862, page 45.
Sept. 29th..	Munson's Hill, (Camp Advance,) Va.	69th Pennsylvania fire into 71st Pennsylvania through mistake.	9	25	.....	.....	.....	.....	List of casualties, File F, No. 29, S. G. O.
Oct. 3d ...	Greenbrier, West Virginia	Battery G, 4th U. S. Artillery. Battery A. 1st Michigan Artillery, 24th, 25th, and 32d Ohio, and 7th, 9th, 13th, 14th, 15th, and 17th Indiana Volunteers.	8	32	.....	100	75	13	Official Report of Brig. General J. J. Reynolds.
Oct. 4th...	Alimosa, near Fort Craig, New Mexico	Mink's New Mexico Cavalry and U. S. Regulars	.....	.....	.....	11	30	.....	Rebellion Record. Vol. III, page 41.
Oct. 4th...	Buffalo Hill, Kentucky	.....	20	.....	.....	50	.....	.....	Unofficial statement.

DATE. 1861.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Oct. 5th..	Chickamicomico, North Carolina	20th Indiana Volunteers							Official reports.
Oct. 8th..	Hillsboro', Kentucky	Flemingsburgh Home Guards	3	2		11	29	22	Newspaper statement.
Oct. 9th..	Santa Rosa, Florida	6th New York Volunteers, detachments of Co. A, 1st U. S. Artillery, Co. H, 2d U. S. Artillery, and Cos. C and E, 3d U. S. Infantry.	14	29	24		350	36	Official Report of Colonel Harvey Brown, U. S. A.
Oct. 12th..	Cameron, Ray County, Missouri	Major James' Cavalry	1	4		8		5	Rebellion Record, Vol. III, page 46.
Oct. 12th..	Upton Hill, Kentucky	39th Indiana Volunteers				5	3		Newspaper statement.
Oct. 12th..	Bayles' Cross Roads, Louisiana	79th New York Volunteers		4					List of casualties, File F, No. 30, S. G. O.
Oct. 13th..	Beckwith Farm, (12 miles from Bird's Point.) Missouri.	Lieutenant Tuft's detachment of cavalry	2	5	3	1	2		Rebellion Record, Vol, III, page 47.
Oct. 13th..	West Glaze, Missouri	10th and 6th Missouri Cavalry and Frémont Battalion Cavalry.				62		36	Official Report of Major C. Wright. Also known as Shanghai, Henrytown, and Monday's Hollow.
Oct. 15th..	Big River Bridge, near Potosi, Missouri.	Forty men of 38th Illinois Volunteers	1	6	33	5	4		List of casualties, File A, 556, S. G. O.
Oct. 15th..	Linn Creek, Missouri	6th Missouri Cavalry and 13th Illinois Volunteers				63	40	37	Official Report of Major C. Wright.
Oct. 16th..	Bolivar Heights, Virginia	Detachments from 28th Pennsylvania, 3d Wisconsin, and 13th Massachusetts Volunteers.	4	7	2			4	Official Report of Colonel J. W. Geary, 28th Pennsylvania Volunteers.
Oct. 16th..	Warsaw, Missouri					3		3	Rebellion Record, Vol, III, p. 51.
Oct. 19th..	Big Hurricane Creek, Missouri	18th Missouri Volunteers	2	14		14		8	List of casualties, File A, 556, S. G. O.
Oct. 21st..	Ball's Bluff, Virginia	15th and 20th Massachusetts, 40th New York, and 71st Pennsylvania Volunteers, and Battery B, Rhode Island Artillery.	223	226	445	36	264	2	*Vide* lists of casualties, S. G. O. Appendix, Part I, Medical and Surgical History of the War, pages 10 to 13. Official Report of Major General McClellan. Acting Brig. General E. D. Baker was killed. Also known as Edward's Ferry, Harrison's Island, and Leesburg.
Oct. 21st..	Wild Cat, Kentucky	33d Indiana, 14th and 17th Ohio Volunteers, 1st Kentucky Cavalry, and 1st Ohio Battery.	4	21		30	200		List of casualties, File A, No. 556 and 588, S. G. O.
Oct. 17th to 21st.	Fredericktown, Missouri	Company A, 1st Missouri Light Artillery, 11th Missouri and 17th, 20th, 21st, 33d, and 38th Illinois Volunteers, 1st Indiana Cavalry, and 8th Wisconsin Volunteers.	6	60			200		Official Report of Colonel J. B. Plummer, 11th Missouri Volunteers, commanding. Including the skirmish at Ironton.
Oct. 22d..	Buffalo Mills, Missouri					17		90	Tribune Almanac.
Oct. 23d..	West Liberty, Kentucky	2d Ohio Volunteers, 1st and Loughlin's Ohio Cavalry, and 1st Ohio Artillery.		2		10	5	34	Ohio in the War, Vol. 2, pages 23 and 747.
Oct. 23d..	Hodgeville, Kentucky	Detachment of the 6th Indiana Volunteers		3		3	5		Unofficial statement.
Oct. 25th..	Springfield, Missouri	Fremont Body-guard, White's Prairie Scouts	18	37	30	106		27	Official Reports of Majors Zagonyi and Wright. Also known as Zagonyi's Charge.
Oct. 26th..	Romney, West Virginia	4th and 8th Ohio and 7th West Virginia Volunteers, 2d Regiment of Potomac Home Brigade, Maryland Volunteers, and Ringgold (Pa.) Cavalry Battalion.	2	15		20	15	500	Official Report of Brigadier General B. F. Kelley, commanding. Also known as Mill Creek Mills.
Oct. 26th..	Saratoga, Kentucky	9th Illinois Volunteers		4		8	17	36	Report of Adjutant General of Illinois, Vol. I, p. 344.

Oct. 27th..	Plattsburg, Clinton Co., Missouri					8		12	Unofficial.
Oct. 27th..	Spring Hill, Missouri	One Company of 7th Missouri Cavalry		5					Volunteer Officers' Official Register, Part VII.
Oct. 29th..	Woodbury and Morgantown, Kentucky	17th Kentucky Volunteers and 3d Kentucky Cavalry		1				2	Unofficial statements.
Nov. 1st..	Renick, Randolph Co., Missouri			14					Rebellion Record, Vol. III, page 268.
Nov. 6th..	Little Santa Fé, Missouri	4th Missouri and 5th Kansas Cavalry, and Kowald's Missouri Battery.	2	6	120				Official.
Nov. 7th..	Belmont, Missouri	22d, 27th, 30th, and 31st Illinois and 7th Iowa Volunteers, Battery B, 1st Illinois Artillery, and two companies of the 15th Illinois Cavalry.	90	173	235	261	427	278	List of casualties. File A, No. 150, S. G. O. Official Reports of Brigadier General U. S. Grant, U. S. A., commanding, and Major General L. Polk. C. S. A. Appendix, Part I, Medical and Surgical History of the War, pages 18 to 22.
Nov. 7th..	Burning of the Royal Yacht, Galveston Harbor, Texas.	Crew of the U. S. Frigate Santee	1	8			3		Official Report of Lieutenant J. E. Jewett, U. S. N.
Nov. 7th..	Port Royal, South Carolina	U. S. Navy	8	23		11	39	7	Official Report of Commodore S. F. Dupont, U. S. N., commanding. Appendix to Part I, Medical and Surgical History of the War, page 231.
Nov. 9th..	Piketown, Pike County, Kentucky	2d, 21st, 33d, 59th Ohio and 16th Kentucky Volunteers. Commanded by Colonel J. W. Sill, 33d Ohio.	4	26		18	45	200	Ohio in the War, Vol. 2, page 23. Also known as Try Mountain.
Nov. 10th..	Taylor's Ford, Wautauga River, Tenn.	Loyal citizens	9	7					Confederate newspapers.
Nov. 10th..	Guyandotte, West Virginia	Recruits of the 9th West Virginia Volunteers	7	20	45	3	10	12	List of casualties, File A, 155, S. G. O. Official Report of Adjutant J. C. Wheeler, 9th West Virginia Volunteers.
Nov. 10th..	Gauley Bridge, West Virginia	11th Ohio Volunteers and 2d Kentucky Cavalry	2	16	5				List of casualties, File F. No. 20, S. G. O.
Nov. 11th..	Little Blue, Missouri	7th Kansas Cavalry (110 men)	7	9					List of casualties, File A, No. 556, S. G. O.
Nov. 12th..	Occoquan Creek, Virginia	Reconnoitering party of the 1st New York Cavalry	3	1	3				Official.
Nov. 17th..	Cypress Bridge, Kentucky		10	15				25	Unofficial.
Nov. 18th..	Palmyra, Missouri	Detachment of the 3d Missouri Cavalry				3	5	16	Rebellion Record, Vol. III, page 82.
Nov. 19th..	Wirt Court-house, West Virginia	Detachment of 1st West Virginia Cavalry, commanded by Captain I. Hill.				1	5		Rebellion Record, Vol. III, page 83.
Nov. 23d..	Pensacola, Fort Pickens, Florida	Batteries A, F, L, 1st U. S. Artillery, C, H, and K, 2d U. S. Artillery; Companies C and E, 3d U. S. Infantry, and Companies G and I, 6th N. Y. Volunteers.	5	7		5	23		Official Report of Colonel Harvey Brown, U. S. A., commanding.
Nov. 24th..	Lancaster, Missouri	21st Missouri Volunteers	1	2		13			Official.
Nov. 24th..	Johnstown, Missouri	Missouri Home Guard							
Nov. 26th..	Independence, Little Blue, Missouri	7th Kansas Cavalry	1	1					Official.
Nov. 26th..	Drainesville, Virginia	1st Pennsylvania Cavalry				2		4	Official Report of Colonel G. D. Bayard, 1st Pennsylvania Cavalry, commanding.
Nov. 26th..	Hunter's Mills, Virginia	3d Pennsylvania Cavalry			29				Unofficial.
Nov. 29th..	Black Walnut Creek, near Sedalia, Mo.	1st Missouri Cavalry		15		17		5	Report of Adjutant General of Missouri, 1865, p. 309.
Dec. 1st..	Morristown, Tennessee								Unofficial.
Dec. 3d..	Salem, Dent County, Missouri	Detachment of the 10th Missouri Cavalry, Major Bowen commanding.	6	10	1	16	20	10	Newspaper statements.
Dec. 3d..	Vienna, Virginia	Detachment of the 3d Pennsylvania Cavalry			45	1			
Dec. 4th..	Anandale, Virginia	3d New Jersey Volunteers (30 men)	1			7		3	Newspaper statement.

DATE. 1861.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Dec. 4th..	Dunksburg, near Sedalia, Missouri	Citizens	.....	.....	.....	7	10	.....	New York Herald, December 7.
Dec. 9th..	Bushy Creek, Arkansas	Union Indians under Opothleyholo	.....	.....	.....	.....	.....	.....	Confederate Newspapers.
Dec. 11th..	Dam No. 4, Potomac, Virginia	12th Indiana Volunteers	.....	.....	70	.....	.....	.....	Indiana Adjutant General's Report, Vol. II, p. 91.
Dec. 11th..	Bertrand, Missouri	2d Illinois Cavalry	1	.....	.....	.....	.....	16	Newspaper statements.
Dec. 12th..	Bagdad Shelby County, Kentucky	6th Kentucky Volunteers	.....	1	.....	.....	.....	.....	Newspaper statements.
Dec. 13th..	Camp Alleghany, West Virginia, Buffalo Mountain.	9th and 13th Indiana, 25th and 32d Ohio, and 2d West Virginia Volunteers. Commanded by Brigadier General R. H. Milroy.	20	107	10	20	96	30	List of casualties, File A, No. 34, S. G. O. Also known as Buffalo Mountain.
Dec. 17th..	Rowlett's Station, Kentucky	32d Indiana Volunteers, commanded by Lieut. Colonel H. von Treba.	10	22	8	33	50	.....	Official Reports of Brigadier General Buell, U. S. A., and Major General Hardee, C. S. A. Report of Adjutant General of Indiana, Vol. I, p. 321. Also known as Mumfordsville and Woodsonville.
Dec. 18th..	Milford, Missouri	27th Ohio and 8th, 18th, 22d, and 24th Indiana Volunteers, 31st Kansas, and 1st Iowa Cavalry, a detachment of U. S. Cavalry and two Batteries of 1st Missouri Light Artillery.	2	8	.....	.....	.....	1,300	Official Report of Major General H. W. Halleck, commanding. Also known as Shawnee Mound and Blackwater.
Dec. 20th..	Drainesville, Virginia	1st, 6th, 9th, 10th, and 12th Regiments Pennsylvania Reserve Corps, 1st Pennsylvania Artillery, and 1st Pennsylvania Cavalry.	7	61	3	43	143	44	List of casualties in the Confederate Army, File A, No. 589. Official Reports of Brigadier General E. O. C. Ord, commanding.
Dec. 21st..	Hudson, Missouri	Detachment of 7th Missouri Cavalry, commanded by Major Nickel.	.....	5	.....	10	.....	17	Rebellion Record, Vol. III, page 117.
Dec. 22d..	Newmarket Bridge, near Newport News, Virginia.	20th New York Volunteers	.....	6	.....	10	20	.....	Newspaper statements.
Dec. 24th..	Wadesburg, Missouri	Missouri Home Guards	.....	2	.....	.....	.....	.....	Official.
Dec. 28th..	Sacramento, Kentucky	3d Kentucky Cavalry, commanded by Colonel Eli H. Murray.	1	8	.....	30	.....	.....	Report of Adjutant General of Kentucky, Vol. I, page 80.
Dec. 28th..	Mount Zion, Missouri	Birges Sharp-shooters and 3d Missouri Cavalry	5	63	4	25	150	35	Official Report of Brigadier General B. M. Prentiss, commanding. Casualty List, S. G. O.
1862. Jan. 1st..	Port Royal, Coosaw River, South Carolina.	3d Michigan, 47th, 48th, 79th New York, and 50th Pennsylvania Volunteers.	1	10	2	.....	.....	.....	List of casualties, File F, No. 201, S. G. O. Appendix, Part I, Medical and Surgical History of the War, page 233.
Jan. 3d..	Hunnewell, Missouri	Four companies of the 10th Missouri Cavalry	.....	.....	.....	.....	.....	8	Unofficial.
Jan. 4th..	Huntersville, Virginia	Detachments of the 25th Ohio Volunteers and 2d West Virginia and 1st Indiana Cavalry.	.....	1	.....	1	7	.....	Report of Adjutant General of Indiana, Vol. I, p. 278.
Jan. 4th..	Bath, Virginia	39th Illinois Volunteers	2	2	16	.....	30	.....	Report of Adjutant General of Illinois, Vol. I, p. 623. Also includes skirmishes at Great Cacapon Bridge, Alpine Station, and Hancock.
Jan. 4th..	Calhoun, Green County, Missouri	.....	.....	10	.....	.....	30	.....	Unofficial.
Jan. 7th..	Blue Gap, near Romney, Virginia	4th, 5th, 7th, and 8th Ohio and 14th Indiana Volunteers and 1st West Virginia Cavalry. Commanded by Col. S. H. Dunning, 5th Ohio.	.....	.....	.....	15	.....	20	Ohio in the War, Vol. 2, page 42.

Jan. 7th..	Jennies Creek, Kentucky	Four companies of the 1st West Virginia Cavalry	3	1	10	6	14	7	Official Report of Colonel J. A. Garfield, commanding. Also known as Paintsville.
Jan. 8th..	Charleston, Missouri	10th Iowa Volunteers	8	16					Report of Adjutant General of Iowa. 1863, page 844; 1865, page 185.
Jan. 8th..	Dry Forks, Cheat River, West Virginia	One company of the 2d West Virginia Cavalry		6		6			Unofficial.
Jan. 8th..	Silver Creek, Randolph County, Missouri.	Detatchments of the 1st and 2d Missouri, 4th Ohio, and 1st Iowa Cavalry.	5	6			80		Report of Adjutant General of Missouri. 1865, page 309. Also known as Roan's Tan Yard and Sugar Creek. Official Report of Major Torrence, 1st Iowa, commanding.
Jan. 9th..	Columbus, Missouri	7th Kansas Cavalry	5						Official.
Jan. 10th..	Middle Creek and Prestonburg, Kentucky.	40th and 42d Ohio and 14th and 22d Kentucky Vols.	2	25		40		25	Official Report of Colonel J. A. Garfield, com'ding.
Jan. 19th and 20th.	Mill Springs, Kentucky	9th Ohio, 2d Minnesota, 4th Kentucky, and 10th Indiana Volunteers and 1st Kentucky Cavalry. Commanded by Brigadier General G. H. Thomas.	38	194		190	160	89	Official Report of Brigadier General George H. Thomas, U. S. A. Appendix, Part I, Medical and Surgical History of the War, page 24. Also known as Logan's Cross Roads, Fishing Creek, Somerset, and Beech Grove. The Confederate General F. K. Zollikoffer was killed.
Jan. 22d..	Knob Noster, Missouri	2d Missouri Cavalry	1						Official.
Jan. 29th..	Occoquan Bridge, Virginia	Detachments of 37th New York Volunteers and 1st New Jersey Cavalry. Commanded by Lieut. Colonel J. Burke, 37th N. Y.	1	4		10			Special Order No. 31, Headquarters Army of the Potomac, January 31, 1862.
Feb. 1st..	Bowling Green, Kentucky	One company of the 2d Indiana Cavalry				3	2		Statement of Captain J. P. Presdee, Co. H, 2d Indiana Cavalry.
Feb. 2d..	Morgan County, Tennessee		7						Confederate sources.
Feb. 6th..	Fort Henry, Tennessee	U. S. gunboats Essex, Carondelet, St. Louis, Cincinnati, Conestoga, Tyler, and Lexington.		40		5	11	63	Official Reports of Flag Officer A. H. Foote, U. S. N., and Brigadier General U. S. Grant, U. S. A. Appendix, Part I, Medical and Surgical History of the War, page 24.
Feb. 8th..	Linn Creek, Logan County, Virginia	Detachment of 5th West Virginia Volunteers	1	1		8	7	16	
Feb. 8th..	Roanoke Island, North Carolina	U. S. gunboats Southfield, Delaware, Stars and Stripes, Louisiana, Hetzel, Commodore Perry, Underwriter, Valley City, Commodore Barney, Hunchback, Ceres, Putnam, Morse, Lockwood, J. N. Seymour, Granite, Brinker, Whitehead, Shawseen, Picket, Pioneer, Hussar, Vidette, Chasseur; 21st, 23d, 24th, 25th, and 27th Massachusetts, 10th Connecticut, 9th, 51st, and 53d New York, 9th New Jersey, 51st Pennsylvania, and 4th and 5th Rhode Island Volunteers.	35	200		16	39	2,527	List of casualties, File A, No. 328, S. G. O. Official Reports of Brigadier General A. E. Burnside, commanding army, and Commodore L. M. Goldsborough, commanding navy. Appendix, Part I, Medical and Surgical History of the War, p 236.
Feb. 10th..	Elizabeth City, North Carolina	U. S. gunboats Delaware, Underwriter, Louisiana, Seymore, Hetzel, Shawseen, Valley City, Putnam, Commodore Perry, Ceres, Morse, Whitehead, and Brinker.	3						Official Report of Commander S. C. Rowan, U. S. N. Also designated Cobb's Point.
Feb. 13th..	Blooming Gap, Virginia	1st West Virginia Cavalry and 8th Ohio and 7th West Virginia Volunteers.	2	5		13		75	Official Report of Brigadier General F. W. Lander, commanding.
Feb. 14th..	Flat Lick Fords, Cumberland River, Ky.	49th Indiana Volunteers and 6th Kentucky Cavalry. Colonel R. Munday, commanding.				4	4	3	Newspaper statement.
Feb. 14th, 15th, and 16th.	Fort Donelson, Tennessee	17th and 25th Kentucky, 11th, 25th, 31st, and 44th Indiana, 2d, 7th, 12th, and 14th Iowa, 1st Nebraska, 58th and 76th Ohio, 8th and 13th Missouri, 8th Wisconsin, and 8th, 9th, 11th, 12th, 17th, 18th, 20th, 28th, 29th, 30th, 31st, 41st, 45th, 46th, 48th, 49th, 57th, and 58th Illinois Volunteers; Batteries B and D, 1st, and D and E, 2d Illinois Artillery; four companies Illinois Cavalry, and Birges's Sharp-shooters, and six gunboats.	446	1,735	150	231	1,067	13,829	Appendix to Part I, Medical and Surgical History of the War, page 25. Official Reports of Brigadier General U. S. Grant, Commodore A. H. Foote, U. S. N., and Brigadier General G. J. Pillow, C. S. A. Sometimes called Dover.
Feb. 14th..	Marshfield, Missouri	6th Missouri and 3d Illinois Cavalry							Report of Adjutant General of Missouri, 1865, p. 346.

DATE. 1862.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Feb. 15th..	Bowling Green, Kentucky. Occupied..	.....	.....	.....	.....	.....	.....	.....	Official Report of Brigadier General D. C. Buell.
Feb. 17th..	Sugar Creek, Missouri.....	1st and 6th Missouri and 3d Illinois Cavalry.....	5	9	1	.....	.....	.....	Report of Adjutant General of Missouri, 1865, pages 310 and 346. Also called Pea Ridge.
Feb. 18th..	Independence, Missouri.....	2d Ohio Cavalry.....	1	3	.....	4	5	5	Ohio in the War, Vol. 2, page 757.
Feb. 21st..	Valverde, New Mexico.....	Detachments of the 1st, 2d, and 5th New Mexico Volunteers; 1st New Mexico and 2d Colorardo Cavalry. Detachments of the 5th, 7th, and 10th U. S. Infantry, and Hall's and McRae's Batteries. Commanded by Col. E. R. S. Canby, U. S. A.	62	140	.....	.....	150	.....	Casualties, Files D, No. 49, and F, No. 261, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 346. Also known as Fort Craig.
Feb. 24th..	Mason's Neck, Occoquan, Virginia.....	37th New York Volunteers.....	2	1	.....	.....	.....	.....	Newspaper statement.
Feb. 26th..	Keytesville, Barry County, Missouri....	6th Missouri Cavalry.....	2	1	1	1	.....	.....	Official.
Mar. 1st...	Sykestown, Missouri.....	7th Illinois Cavalry and 10th Illinois Volunteers (detachments of Halleck's Army.)	.....	.....	1	.....	.....	3	Official Report of Major General H. W. Halleck.
Mar. 2d...	Pittsburg Landing, Tennessee.....	U. S. gunboats Lexington and Tyler and 32d Illinois Volunteers.	5	5	4	20	200	.....	List of casualties, File A, No. 570, S. G. O. Official Report of Commodore A. H. Foote, U. S. N.
Mar. 3d...	New Madrid, Missouri.....	5th Iowa, 59th Indiana, 39th and 63d Ohio Volunteers and 2d Michigan and 7th Illinois Cavalry (portion of General Halleck's command.)	1	3	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1863, Vol. II, page 183.
Mar. 5th ..	Occoquan, Virginia.....	Reconnoitering party of the 63d Pennsylvania Volunteers.	2	2	.....	.....	.....	.....	Unofficial
Mar. 6th, 7th and 8th.	Pea Ridge, Arkansas.....	25th, 35th, 36th, 37th, 44th, and 59th Illinois. 2d, 3d, 12th, 15th, 17th, 24th, and Phelps' Missouri, 8th, 18th, and 22d Indiana, and 4th and 9th Iowa Volunteers; 3d Iowa, 3d and 15th Illinois, and 1st, 4th 5th, and 6th Missouri Cavalry; Batteries B and F, 2d Missouri Light Artillery, 2d Ohio Battery, 1st Indiana Battery, and Battery A, 2d Illinois Artillery.	203	972	174	1,100	2,500	1,600	Appendix to Part I, Medical and Surgical History of the War, page 365. List of casualties, File A, Nos. 125 and 570, S. G. O. Official Reports of Brigadier General Samuel R. Curtis, commanding. Includes the engagements at Bentonville on the 6th, Leetown on the 7th, and Elkhorn Tavern on the 8th. Among the casualties on the Union side were Brigadier General Asboth and Acting Brigadier General Carr, wounded; on the Confederate side, Brigadier General B. McCulloch and Acting Brig. General James McIntosh, killed.
Mar. 7th...	Fox Creek, Missouri	4th Missouri Cavalry.....	.....	5	.....	.....	.....	.....	Official.
Mar. 8th...	Near Nashville, Tennessee	1st Wisconsin Volunteers and 4th Ohio Cavalry.....	1	2	.....	4	.....	4	Adjutant General's Report, Wisconsin, 1865, p. 33.
Mar. 8th...	Mississippi City, Mississippi	26th Massachusetts Volunteers.....	.....	.....	.....	.....	.....	.....	Adjutant General's Report, Massachusetts, 1862, page 286.
Mar. 9th...	Mountain Grove, Missouri.....	10th Missouri Cavalry.....	10	2	.....	.....	.....	.....	Official.
Mar. 9th...	Hampton Roads, near Newport News, Virginia.	Minnesota, Congress, Cumberland, and Monitor; 20th Indiana and 7th and 11th New York Volunteers.	261	108	40	7	17	.....	List of casualties, File F, No. 85. Monitor and Merrimac. Flag Officer Buchanan, C. S. N., was wounded.
Mar. 10th..	Burke's Station, Virginia.....	One company 1st New York Cavalry.....	1	.....	.....	3	5	11	
Mar. 10th..	Jacksboro', Big Creek Gap, Tennessee ..	2d Tennessee Volunteers.....	.....	2	.....	2	4	15	Adjutant General's Report, Tennessee, 1866, p. 56.
Mar. 11th..	Paris, Tennessee.....	Detachments of the 5th Iowa and 1st Nebraska Cavalry, and Battery K, 1st Missouri Artillery.	5	5	1	.....	10	5	Official Report of Major General H. W. Halleck, U. S. A.

Mar. 12th..	Lexington, Lafayette County, Missouri..	1st Iowa Cavalry	1	1	.....	9	3	.....	
Mar. 12th..	Near Lebanon, Missouri		.....	.....	.....	13	5	20	Official Report of Major General H. W. Halleck, U. S. A.
Mar. 13th..	New Madrid, Missouri	10th and 16th Illinois, 27th, 39th, 43d, and 63d Ohio Volunteers; 3d Michigan Cavalry, 1st U. S. Infantry, and Bissell's Missouri Engineers.	.....	50	.....	.....	100	.....	Official Report of Brigadier General John Pope, U. S. A.
Mar. 14th..	Newberne, North Carolina	51st New York, 8th, 10th, and 11th Connecticut, 21st, 23d, 24th, 25th, and 27th Massachusetts, 9th New Jersey, 51st Pennsylvania, and 4th and 5th Rhode Island Volunteers.	91	466	.....	64	106	413	Appendix to Part I, Medical and Surgical History of the War, page 237. List of casualties, File A, No. 348, S. G. O. Official Reports of Brigadier General A. E. Burnside, commanding.
Mar. 14th..	Pound Gap, Cumberland Mountains, Tennessee.	Detachments of the 22d Kentucky, 40th and 42d Ohio Volunteers, and 1st Ohio Cavalry.	.....	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 268. Also known as Sounding Gap.
Mar. 16th..	Aquia Creek Batteries, Virginia	U. S. Gunboats Yankee and Anacostia	.....	.....	.....	.....	.....	.....	
Mar. 16th..	Black Jack Forrest, Tennessee	Detachments of the 4th Illinois and 5th Ohio Cavalry..	.....	4	.....	.....	.....	2	Official.
Mar. 18th..	Salem, Arkansas	Detachments of the 6th Missouri and 3d Iowa Cavalry.	5	10	.....	.....	.....	100*	Official Report of Major General H. W. Halleck. Also known as Spring River.
Mar. 21st..	Mosquito Inlet, Florida	U. S. gunboats Penguin and Henry Andrew	8	8	2	.....	.....	.....	Official Report of Commodore S. F. Dupont, U. S. N.
Mar. 22d...	Independence, Missouri	2d Kansas	1	2	.....	7	.....	11	Newspaper statement. Also called Little Santa Fé.
Mar. 23d...	Carthage, Missouri	6th Kansas Cavalry	.....	1	.....	.....	.....	.....	Official.
Mar. 23d...	Winchester, Virginia	1st West Virginia, 84th and 110th Pennsylvania, 5th, 7th, 8th, 29th, 62d, and 67th Ohio, 7th, 13th, and 14th Indiana, and 39th Illinois Volunteers; 1st West Virginia, 1st Ohio, and Co. E, 4th U. S. Artillery; 1st Michigan and 1st Ohio Cavalry.	103	440	24	80	342	269	List of casualties, File A, No. 345, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 229. Official Report. Brig. General James Shields, commanding the Union forces, was wounded. Also designated Kearnstown.
Mar. 26th..	Warrensburg, Missouri	Sixty men of the 7th Missouri Militia Cavalry	1	22	.....	9	17	.....	Also designated Briar.
Mar. 26th..	Humonsville, Polk County, Missouri	Co. B, 8th Missouri Militia Cavalry	.....	5	.....	15	.....	.....	Official.
Mar. 26th to 28th.	Apache Cañon, near Santa Fé, New Mexico.	1st and 2d Colorado Cavalry	32	75	35	36	60	93	Official Report of Brigadier General H. F. Sibley, C. S. A. Also known as Glorietta.
Mar. 27th..	Strasburg, Virginia	Portion of Brigadier General Banks' command	.....	.....	.....	.....	.....	.....	Adjutant General's Report, Michigan, 1862, p. 53.
Mar. 28th..	Middleburg, Virginia	28th Pennsylvania Volunteers, Colonel Geary, com'g	.....	.....	.....	.....	.....	.....	Newspaper statements.
Mar. 28th..	Warrensburg, Missouri	1st Illinois Cavalry	3	1	.....	15	.....	25	
Mar. 30th..	Union City, Tennessee	2d Illinois Cavalry	.....	.....	.....	.....	.....	.....	Newspaper statement.
April 2d...	Putnam's Ferry, near Doniphan, Missouri.	5th Illinos Cavalry. 21st and 38th Illinois Volunteers, and 16th Ohio Battery, Colonel Carlin's Brigade, (General Steele's command.)	.....	.....	.....	3	.....	7	Adjutant General's Report, Illinois, Vol. III, p. 54.
April 4th..	Pass Christian, Mississippi	9th Connecticut and 6th Massachusetts Artillery,	.....	.....	.....	.....	.....	.....	Official Report of Major General B. F. Butler.
April 4th..	Great Bethel, Virginia	Advance of the 3d Corps, Army of the Potomac	4	10	.....	.....	.....	.....	Official.
April 5th to May 3d.	Siege of Yorktown	2d, 3d, and 4th Corps, Army of the Potomac	.....	.....	.....	.....	.....	.....	Official Report of Major General G. B. McClellan. Appendix to Part I, Medical and Surgical History of the War, page 44.
April 4th..	Crump's Landing, Tennessee	5th Ohio Cavalry and 48th, 70th, and 72d Ohio Vols.	.....	2	8	.....	20	8	Ohio in the War, Vol. 2, page 779. Also called Adamsville.
April 2d...	Thoroughfare Gap, Virginia	28th Pennsylvania Volunteers	.....	.....	.....	.....	.....	.....	Newspaper statements.

* Killed, wounded, and missing.

DATE. 1862.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
April 6th and 7th.	Shiloh, Tennessee	1st Division, Major General J. A. McClernand; 2d Division, Major General C. F. Smith; 3d Division, Brigadier General Lewis Wallace; 4th Division, Brigadier General S. A. Hurlburt; 5th Division, Brigadier General W. T. Sherman; and 6th Division, Brigadier General B. M. Prentiss—Army of the District of Western Tennessee, commanded by Major General U. S. Grant: 2d Division, Brigadier General A. M. D. Cook; 4th Division, Brigadier General W. Nelson; 5th Division, Brigadier General T. L. Crittenden; and the 21st Brigade of the 6th Division—Army of the Ohio, commanded by Major General D. C. Buell; and gunboats Tyler and Lexington.	1,735	7,882	3,956	1,728	8,012	959	Official Reports of Major Generals U. S. Grant and D. C. Buell, U. S. A., and G. T. Beauregard, C. S. A. Appendix to Part I, Medical and Surgical History of the War, page 37. Also called Pittsburg Landing. Among the casualties in the Confederate army were Major General A. S. Johnson, commander-in-chief, and Brig. General A. H. Gladden, killed; Major General W. S. Cheatham, Brigadier Generals C. Clark, B. R. Johnson, and J. S. Bowen, wounded. On the Union side, Brigadier Generals W. T. Sherman and W. H. L. Wallace, wounded, and B. M. Prentiss, captured.
April 8th..	Island No. 10, Tennessee	Navy, commanded by Flag Officer A. H. Foote; Army, commanded by Major General John Pope.	.....	.....	.....	17	.....	3,000	Official Reports of Commodore Foote and Major General Pope. Siege commenced March 16th.
April 9th..	Owen's River, California	2d California Cavalry	1	2	.....	.....	.....	.....	Official.
April 10th.	Fort Pulaski, Georgia	6th and 7th Connecticut, 3d Rhode Island, 46th and 48th New York, and 8th Maine Volunteers; 15th U. S. Infantry and crew of U. S. S. Wabash.	1	.....	.....	.....	4	360	Official Report of Major Gen. D. Hunter, U. S. A., commanding.
April 11th.	Huntsville, Alabama	3d Division Army of the Ohio	.....	.....	.....	.....	.....	200	Official Report of Brigadier General O. M. Mitchell, U. S. A., commanding.
April 11th.	Skirmish before Yorktown, Virginia	12th New York and 57th and 63d Pennsylvania Volunteers.	2	8	.....	.....	.....	.....	Newspaper statements.
April 12th.	Little Blue River, Missouri	.....	.....	.....	.....	5	.....	17	Newspaper statement.
April 8th..	Reconnoissance on the Corinth Road, Mississippi.	3d Brigade, 5th Division, Army of Western Tennessee, and 4th Illinois Cavalry.	.....	.....	.....	15	25	200	Official Report of Brigadier General W. T. Sherman.
April 12th.	Monterey, Virginia	75th Ohio Volunteers and 1st West Virginia Cavalry	.....	3	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 434.
April 14th.	Pollocksville, North Carolina	.....	.....	.....	.....	.....	7	1	Confederate sources.
April 14th.	Diamond Grove, Missouri	6th Kansas Cavalry	.....	1	.....	.....	.....	.....	
April 14th.	Walkersville, Missouri	2d Missouri Militia Cavalry	2	3	.....	.....	.....	.....	
April 14th.	Montavallo, Missouri	Two companies of 1st Iowa Cavalry	2	6	.....	2	10	5	Official Report of the Adjutant General of Iowa, 1863, Vol. II, page 845.
April 15th.	Peehacho Pass, D. T	1st California Cavalry	3	3	.....	.....	.....	.....	Monthly Report of Sick and Wounded, 5th California Volunteers.
April 15th.	Peralto, New Mexico	.....	.....	.....	.....	.....	.....	.....	Official.
April 16th.	Savannah, Tennessee	.....	.....	.....	.....	5	65	.....	Rebellion Record, Vol. IV, page 90.
April 16th.	Whitemarsh, Georgia	8th Michigan Volunteers and Battery of Rhode Island Light Artillery.	10	35	.....	5	7	.....	Official Report of Colonel W. M. Fenton, 8th Michigan Volunteers. Also known as Wilmington Island.
April 16th.	Lee's Mills, Virginia	3d, 4th, and 6th Vermont Volunteers, 3d New York Battery, and Battery of 5th U. S. Artillery.	35	129	9	20	75	50	Casualty List, File A, No. 538, S. G. O.
April 14th.	Fort Pillow, Tennessee, bombarded	.....	.....	.....	.....	.....	.....	.....	Official Dispatch of Commodore A. H. Foote, U.S.N.

April 17th.	Holly River, West Virginia	10th West Virginia Volunteers	.....	3	.....	2	.....	.....	Rebellion Record, Vol. IV, page 91.
April 18th.	Falmouth (near Fredericksburg), Va	2d New York Cavalry	5	16	.....	.....	.....	19	Casualty List, File A, No. 571, S. G. O.
April 19th.	Talbot's Ferry, Arkansas	4th Iowa Cavalry	1	.....	.....	3	.....	.....	
April 19th.	Camden, North Carolina	21st Massachusetts. 51st Pennsylvania, 6th New Hampshire, and 9th and 89th New York Volunteers.	12	98	14	6	19	3	Official Report of Major General A. E. Burnside, U. S. A., and Major General B. Huger, C. S. A. Also known as South Mills.
April 18th.	Edisto Island, South Carolina	Crew of U. S. S. Crusader, 3d New Hamphshire, and 55th Pennsylvania Volunteers.	.....	3	.....	.....	.....	.....	Official Report of Commodore S. F. Du Pont.
April 23d..	Grass Lick, West Virginia	3d Maryland and Potomac Home Brigade	3	.....	.....	.....	.....	5	Official Report of Major General J. C. Frémont.
April 25th.	Fort Macon, North Carolina	U. S. gunboats Daylight, State of Georgia, Chippewa, and the bark Gemsbok (commanded by Commander S. Lockwood), and General Parkes' Division.	1	11	.....	7	18	450	Official Reports. Brigadier General A. E. Burnside, commanding.
April 26th.	Turnback Creek, Missouri	5th Kansas Cavalry	1	.....	.....	.....	.....	.....	Official.
April 26th.	Neosha, Missouri	1st Missouri Cavalry	3	2	.....	.....	30	62	Official.
April 26th.	Redoubt before Yorktown, Virginia	Three companies of the 1st Massachusetts Volunteers	3	16	.....	.....	.....	14	Casualty List, File A, No. 571, S. G. O.
April 27th.	Horton's Mills, near Newberne, North Carolina.	103d New York Volunteers	1	6	.....	3	.....	10	
April 28th.	Paint Rock Railroad Bridge	Twenty-two men of the 10th Wisconsin Volunteers	.....	7	.....	.....	.....	.....	Major General D. C. Buell's Order, July 21st, 1862.
April 18th to Apr. 28th.	Forts Jackson and St. Philip and capture of New Orleans, Louisiana.	Fleet of war-vessels, commanded by Commodore D. G. Farragut, and mortar-boats, commanded by Commander D. D. Porter.	36	193	.....	185	197	400	Official Report of Commodore D. G. Farragut, U. S. N.
April 28th	Cumberland Mountain, Tennessee	22d Kentucky and 16th and 42d Ohio Volunteers	.....	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 117.
April 28th.	Monterey, Tennessee	2d Iowa Cavalry	1	3	.....	5	.....	18	Report of Adjutant General of Iowa, 1863, p. 857.
April 29th.	Bridgeport, Alabama	3d Division Army of the Ohio	.....	.....	.....	.....	72 †	350	Official Report of Brigadier General O. M. Mitchell, commanding.
May 1st....	Clarke's Hollow, West Virginia	Co. C, 23d Ohio Volunteers	1	21	.....	.....	.....	.....	Newspaper statements. Casualty List, File A, No. 571, S. G. O.
May 3d...	Farmington, Mississippi	10th, 16th, 22d, 27th, 42d, and 51st Illinois. and 10th and 16th Michigan Volunteers, Yates' Illinois Sharpshooters, 2d Michigan Cavalry, and Battery C, 1st Illinois Artillery.	2	12	.....	30	.....	.....	Official Report of Major General John Pope.
May 4th...	Licking, Missouri	5th Missouri Militia Cavalry and 24th Missouri Volunteers.	1	2	.....	.....	.....	.....	Official.
May 4th...	Cheese Cake Church, Virginia	3d Pennsylvania and 1st and 6th U. S. Cavalry	.....	.....	.....	.....	.....	.....	Casualty List, File A, No. 548, S. G. O.
May 5th...	Lebanon, Tennessee	Detachments of the 7th Pennsylvania Cavalry and 1st, 4th, and 5th Kentucky Cavalry.	6	25	1	.....	.....	66	Official Report of Brigadier General E. Dumont.
May 5th...	Lockridge Mills, Kentucky	5th Iowa Cavalry	4	16	68	.....	.....	.....	Adjutant General's Report, Iowa, 1864, page 985, Also known as Dresden.
May 5th...	Williamsburg, Virginia	Third and Fourth Corps, Army of the Potomac	456	1,400	372	.....	.....	1,000 *	Casualty List, File A, No. 521, S. G. O. Official Report of Major General G. B. McClellan. Appendix to Part I, Medical and Surgical History of the War, page 44.
May 7th...	West Point, Virginia	16th, 31st, and 32d New York, 95th and 96th, Pennsylvania, and 5th Maine Volunteers, 1st Massachusetts, and Battery D, 2d U. S. Artillery.	49	104	41	.....	.....	.....	Casualty List. File A. No. 285. S. G. O. Also known as Eltham's Landing. Official Report of Major General McClellan.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1862.	LOCALITY.	UNION TROOPS ENGAGED	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
May 7th...	Somerville Heights, Virginia.....	13th Indiana Volunteers.....	2	7	24	.....	.....	7	Report of Adjutant General of Indiana, page 110. Casualty List, File A, No. 571, S. G. O.
May 8th...	McDowell, Virginia.....	25th, 32d 75th, and 82d Ohio and 3d West Virginia Volunteers, 1st West Virginia and 1st Connecticut Cavalry, and 1st Indiana Battery, Brigadier General R. H. Milroy commanding.	28	225	3	100	200	.....	Appendix to Part I, Medical and Surgical History of the War, page 117. Casualty List, File A, No. 409, S. G. O. Official Report. Also known as Bull Pasture Mountain. General Johnson, C. S. A., was wounded.
May 8th...	Glendale, near Corinth, Mississippi.....	7th Illinois Cavalry.....	1	4	.....	.....	30†	4	
May 9th...	Elkton Station, near Athens, Alabama ..	Company E, 37th Indiana.....	5	.....	43	13	.....	.....	Report of Adjutant General of Indiana.
May 9th...	Slatersville, Virginia.....	6th U. S. Cavalry, and 98th Pennsylvania and 2d Rhode Island Volunteers.	4	3	.....	10	14	2	Also known as New Kent Court House. Casualty List, File A, No. 571.
May 9th...	Farmington, Mississippi	Two brigades of the Army of the Mississippi.....	.....	.....	.....	.....	.....	.....	Casualty List, File A, No. 412, S. G. O. Official Report of Major General John Pope, commanding.
May 10th..	Fort Pillow, Tennessee.....	U. S. gunboats Cincinnati and Mound City.....	.....	3	.....	2	1	.....	Official Report of Captain C. H. Davis, U. S. N.
May 10th..	Norfolk, Virginia.....	10th, 20th, and 99th New York, 1st Delaware, 58th Pennsylvania, 20th Indiana, and 16th Massachusetts Volunteers, Battery D, 4th U. S. Artillery, and 1st New York Mounted Rifles.	.....	.....	.....	.....	.....	.....	Official Report of Major General John Wool.
May 11th..	Bloomfield, Missouri.....	1st Wisconsin Cavalry.....	.....	.....	.....	1	.....	11	Newspaper statement.
May 13th..	Reedy Creek, Cumberland Mountains, West Virginia.	.....	.....	.....	.....	.....	.....	.....	Official Report of Brigadier General B. F. Kelley.
May 13th..	Rodgersville, Alabama.....	1st Wisconsin and 38th Indiana Volunteers, and Cavalry commanded by Colonel Starkweather.	.....	.....	.....	.....	.....	.....	Reports of Adjutants General of Wisconsin and Indiana.
May 13th..	Monterey, Tennessee.....	Portion of Brigadier General M. L. Smith's Brigade...	.....	2	.....	2	3	5	
May 14th..	Trenton Bridge, North Carolina.....	17th, 25th, and 27th Massachusetts Volunteers, Battery B, 3d N. Y. Artillery, and two troops of the 3d New York Cavalry.	.....	.....	.....	9	.....	.....	Newspaper account.
May 15th..	Linden, Virginia.....	One company of the 28th Pennsylvania Volunteers	1	3	14	.....	.....	.....	Official.
May 15th..	Fort Darling, James River, Virginia.....	U. S. S. Galena, Port Royal, Naugatuck, Monitor, and Aristook.	12	14	.....	7	8	.....	Official Report of Commander John Rodgers, U.S.N.
May 15th..	Chalk Bluffs, Missouri.....	1st Wisconsin Cavalry.....	1	3	3	.....	.....	.....	Official.
May 15th..	Butler, Bates County, Missouri	1st Iowa Cavalry	3	1	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1863, Vol. II, page 845.
May 17th..	Russell's House, before Corinth, Mississippi.	General M. L. Smith's Brigade of the 5th Division, Army of Tennessee.	10	31	.....	12	.....	1	Casualty List, File A, No. 564, S. G. O. Official Report of Brigadier General W. T. Sherman.
May 15th, 16th, & 18th	Princeton, West Virginia.....	Kanawha Division, commanded by General J. D. Cox..	30	70	29	2	14	.....	Casualty List, File A, No. 410, S. G. O. Official Report of Brigadier General H. Marshall, C.S.A.
May 19th..	Searcy Landing, Little Red River, Arkansas.	Detachments of 4th Missouri Cavalry, 3d and 17th Missouri Volunteers, Battery B, 1st Missouri Light Artillery.	18	27	1	.....	.....	150*	Official.
May 19th..	Clinton, North Carolina	.....	.....	5	.....	9	.....	2	

May 21st...	Phillip's Creek, Mississippi	Brigadier General Thomas A. Davis's 2d Division Army of Tennessee.	.....	3	.....	.....	.....	.....	Official.
May 22d...	Florida, Monroe County, Missouri	Detachment of the 3d Iowa Cavalry	.....	2	.....	.....	.....	.....	Official.
May 22d...	New Berne (near), North Carolina	Company I, 17th Massachusetts Volunteers	3	8	.....	.....	.....	.....	Rebellion Record, Vol. V, page 15.
May 23d...	Lewisburg, Virginia	36th and 44th Ohio Volunteers and 2d West Virginia Cavalry.	14	60	5	40	66	100	Casualty List, File A, No. 427, S. G. O. Official Report of Colonel George Crook.
May 23d...	Front Royal, Virginia	1st Maryland Volunteers and detachments of the 29th Pennsylvania, Captain Mape's Pioneers, and 5th New York Cavalry, and 1st Pennsylvania Artillery.	32	122	750	.....	.....	.....	Casualty List, File A No. 616, S. G. O. Official Report of Major General N. P. Banks.
May 23d...	Buckton Station, Virginia	3d Wisconsin and 27th Indiana Volunteers	2	6	.....	12	.....	.....	Report of Adjutant General of Wisconsin, 1865, page 97.
May 23d...	Fort Craig, New Mexico	3d U. S. Cavalry	.....	3	.....	.....	.....	.....	Rebellion Record, Vol. V, page 15.
May 24th..	Middletown, Virginia	46th Pennsylvania and 28th New York Volunteers, 1st Maine and 1st Vermont Cavalry, and one battery of New York Artillery.	.....	.....	.....	.....	.....	.....	Official Report of Major General N. P. Banks. Skirmish on Banks' retreat to Winchester.
May 24th..	New Bridge, Virginia	4th Michigan Volunteers	1	10	.....	.....	60†	27	Casualty List, File A, 571, S. G. O.
May 24th..	Chickahominy, Virginia	Davidson's Brigade, Smith's Division, Fourth Corps	2	4	.....	.....	.....	1	
May 24th..	Newtown, Virginia	28th New York, 2d Massachusetts, 29th Pennsylvania, 27th Indiana, and 3d Wisconsin Volunteers, and two batteries of Artillery.	.....	.....	.....	.....	.....	.....	Official Report of Colonel George H. Gordon, 2d Massachusetts Volunteers. Skirmish on Banks' retreat.
May 25th..	Winchester, Virginia	2d Massachusetts, 29th Pennsylvania, 27th Indiana, 3d Wisconsin, 28th New York, 5th Connecticut, and 46th Pennsylvania Volunteers, Battery M, 1st New York Artillery, and 1st Vermont, 1st Michigan, and 5th New York Cavalry.	38	155	711	.....	.....	.....	Casualty Lists, File A, No. 178 and 616. Official Report of Major General N. P. Banks, commanding. Appendix, Part I, Medical and Surgical History of the War, page 230.
May 27th..	Hanover Court House, Virginia	12th, 13th, 14th, 17th, 25th, and 44th New York, 62d and 83d Pennsylvania, 16th Michigan, and 9th and 22d Massachusetts Volunteers, 5th Massachusetts, 2d Maine, and Battery F, 5th U. S. Artillery, and 1st U. S. Sharpshooters.	53	344	.....	.....	200†	730	Casualty List, File A, No. 549. Official Report of Major General McClellan. Appendix, Part I, Medical and Surgical History of the War, p. 56.
May 27th..	Big Indian Creek, near Searcy, Arkansas	1st Missouri Cavalry	.....	3	.....	5	25	.....	Report of Adjutant General of Missouri, 1865, p. 311.
May 27th..	Osceola, Missouri	1st Iowa Cavalry	3	2	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1863, Vol. II, page 846.
May 28th..	Charlestown and Harper's Ferry, Virginia		.....	.....	9	.....	.....	.....	Official Report of Brigadier General R. Saxton.
May 28th..	Cache River Bridge, Arkansas	9th Illinois Cavalry	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 19.
May 28th..	Wardensville, Virginia	3d Maryland Potomac Home Brigade and 3d Indiana Cavalry.	.....	.....	.....	2	3	.....	Newspaper statements.
May 28th and 29th.	Sylamore, Arkansas	10th Missouri and 3d Iowa Cavalry	.....	.....	.....	.....	.....	.....	
May 29th..	Pocataligo, South Carolina	50th Pennsylvania, 79th New York, and 8th Michigan Volunteers, and 1st Massachusetts Cavalry.	2	9	.....	.....	.....	.....	Official Report of Colonel B. C. Christ, commanding.
May 30th..	Booneville, Mississippi	2d Iowa and 2d Michigan Cavalry	.....	.....	.....	.....	.....	2,000	Official Report of Major General John Pope.
May 30th..	Tuscumbia Creek, Mississippi		3	.....	3	.....	.....	.....	
May 30th..	Front Royal, Virginia	1st Rhode Island Cavalry. Advance of Major General McDowell's command.	5	8	1	.....	.....	156	Report of Adjutant General of Rhode Island, page 361.
May 30th..	Evacuation of Corinth, Mississippi		.....	.....	.....	.....	.....	.....	Official reports.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1862.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
May 31st..	Neosho, Missouri	10th Illinois Cavalry and 14th Missouri Militia Cavalry.	2	3	.....	.....	.....	.....	
May 31st..	Greenville Road, near Washington, N. C.	3d New York Cavalry	.....	1	.....	3	2	6	Rebellion Record, Vol. V, page 21.
June 1st...	Seabrook's Point, South Carolina		.....	.....	.....	.....	.....	.....	Official.
May 31st and June 1st.	Seven Pines and Fair Oaks, Virginia....	Second Corps, Major General E. V. Sumner; Third Corps, Major General S. P. Heintzelman; and Fourth Corps, Major General E. D. Keyes, Army of the Potomac.	890	3,627	1,222	2,800	3,897	1,300	Official Report of Major General McClellan. List of casualties, File A, No. 522, S. G. O. Appendix, Part I, Medical and Surgical History of the War, page 63. Among the casualties on the Union side were Brigadier Generals Wessells, Naglee, and O. O. Howard, wounded. On the Confederate side, General J. E. Johnston, commanding, and Brigadier General R. E. Rhodes were wounded, Brigadier General Robert Hatton killed, and J. J. Pettigrew captured.
June 1st and 2d.	Strasburg and Staunton Road, Virginia (Jackson's Retreat).	8th West Virginia and 60th Ohio Volunteers, 1st New Jersey and 1st Pennsylvania Cavalry.	.....	2	11	.....	.....	.....	New Jersey and the Rebellion, page 415.
June 3d ...	Legare's Point, South Carolina	28th Massachusetts and 100th Pennsylvania Volunteers.	.....	5	23	.....	.....	.....	Report of Adjutant General of Massachusetts, 1862, page 300.
June 4th...	Fort Pillow, Tennessee	Mississippi Flotilla, Commodore C. H. Davis	.....	.....	.....	.....	.....	.....	Official. Also known as Fort Wright.
June 4th...	Jasper, Sweden's Cove, Tennessee	5th Kentucky and 7th Pennsylvania Cavalry, 79th Pennsylvania Volunteers, and 1st Ohio Battery.	2	7	.....	20	30	12	Official Report of Brigadier General J. P. Negley.
June 4th...	Blackland, Mississippi	2d Iowa and 2d Michigan Cavalry.	5	14	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1863, p. 853.
June 5th...	Tranter's Creek, North Carolina	24th Massachusetts Volunteers, Company I, 3d New York Cavalry, and Marine Artillery.	7	11	.....	.....	.....	.....	Report of Adjutant General of Massachusetts, 1862, page 274.
June 6th...	Memphis, Tennessee	U. S. gunboats Benton, Louisville, Carondelet, Cairo, and St. Louis, and rams Queen of the West and Monarch.	.....	.....	.....	.....	80†	100	Official Report of Commander C. H. Davis, U.S.N.
June 6th...	Harrisonburg, Virginia	1st New Jersey Cavalry, 1st Pennsylvania Rifles, 60th Ohio and 8th West Virginia Volunteers.	.....	.....	63	17	50	3	Official Reports of Generals J. C. Fremont and T. J. Jackson. General T. W. Ashby, commanding the Confederate cavalry, was killed.
June 8th...	Cross Keys, Virginia	8th, 39th, 41st, 45th, 54th, and 58th New York, 2d, 3d, 5th, and 8th West Virginia, 25th, 32d, 55th, 60th, 73d, 75th, and 82d Ohio, and 1st and 27th Pennsylvania Volunteers, and 1st Ohio Battery.	125	500	.....	42	230	15	Casualty List, File A, No. 422, S. G. O. Official Reports of Major General J. C. Fremont, U.S. A., and Lieutenant General T. J. Jackson, C. S. A. Also known as Union Church. Among the casualties were Brigadier Generals J. H. Stewart and A. Elzey, C. S. A., wounded.
June 9th...	Baldwin, Mississippi	2d Iowa and 2d Michigan Cavalry.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1863, p. 853.
June 9th...	Port Republic, Virginia	5th, 7th, 29th, and 66th Ohio, 84th and 110th Pennsylvania, 7th Indiana, and 1st West Virginia Volunteers, and Batteries E, 4th U. S., and A and L, 1st Ohio Artillery.	67	361	574	88	535	34	Official Reports of Brigadier General E. B. Tyler, U. S. V., and Lieutenant General T. J. Jackson, C. S. A.
June 10th..	James Island, South Carolina		3	13	.....	17	30	6	Official Reports.

June 11th..	Monterey, Owen County, Kentucky.....	Captain Blood's mounted provost guards and 13th Indiana Battery.	2	.....	.....	.....	.....	100	Report of Adjutant General of Indiana, Vol. III, page 421.
June 12th..	Waddell's Farm, near Village Creek, Arkansas.	Detachment of the 9th Illinois Cavalry.....	.....	12	1	.....	.....	28*	Official Report of Colonel A. G. Brackett, 9th Illinois Cavalry.
June 13th..	Old Church, Virginia.....	5th U. S. Cavalry.....	.....	.....	.....	1	.....	.....	Official Report of Major General McClellan.
June 13th..	James Island, South Carolina.....	.....	3	19	.....	19	6	.....	Rebellion Record, Vol. V, page 27.
June 14th..	Tunstall Station, Virginia	.....	4	8	.....	.....	.....	.....	Railroad train fired into.
June 16th..	Secessionville, James Island, South Carolina.	46th, 47th, and 79th New York, 3d Rhode Island, 3d New Hampshire, 45th, 97th, and 100th Pennsylvania, 6th and 7th Connecticut, 8th Michigan, and 28th Massachusetts Volunteers, 1st New York Engineers, 1st Connecticut, Batteries E, 3d U. S., and 1, 3d Rhode Island Artillery, and Company H, 1st Massachusetts Cavalry.	85	472	128	51	144	9	Official Reports of Brigadier Generals H. G. Wright and I. I. Stevens, U. S. V., and Major General J. C. Pemberton, C. S. A. Also designated as Fort Johnson.
June 17th..	St. Charles, White River, Arkansas.....	U. S. gunboats Lexington, Mound City, Conestoga, and St. Louis; 43d and 46th Indiana Volunteers.	105	30	.....	.....	125†	30	Official Report of Commander C. H. Davis, U.S.N.
June 17th..	Warrensburg, Missouri.....	7th Missouri Militia Cavalry.....	2	2	.....	.....	.....	.....	Official.
June 18th..	Smithville, Arkansas.....	.....	2	4	.....	.....	4	15	Rebellion Record. Vol. V, page 29.
June 18th..	Cumberland Gap occupied.....	Brigadier General G. W. Morgan's command.....	.....	.....	.....	.....	.....	.....	Official.
June 18th..	Talahatchie, Florida.....	.....	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 29.
June 18th..	Williamsburg Road, Virginia.....	16th Massachusetts Volunteers.....	7	57	11	5	9	.....	Report of Adjutant General of Massachusetts, 1862, page 190. Official Report of Major General B. Huger, C. S. A.
June 21st..	Battle Creek, Tennessee.....	2d and 33d Ohio, 10th Wisconsin, and 24th Illinois Volunteers, 4th Ohio and 4th Kentucky Cavalry, and Edgarton's Battery.	4	3	.....	.....	.....	.....	Casualty List, File A, No. 570, S. G. O. Newspaper statements.
June 22d..	Raceland, near Algiers, Louisiana.....	8th Vermont Volunteers.....	3	8	.....	.....	.....	.....	Report of Adjutant General of Vermont.
June 23d..	Raytown, Missouri.....	7th Missouri Cavalry.....	1	1	.....	.....	.....	.....	Official.
June 25th..	Oak Grove, Virginia	Hooker's and Kearney's Divisions of the Third, and Palmer's Brigade of Couch's Division of the Fourth, and part of Richardson's Division of the Second Corps.	51	401	64	65	465	11	Casualty List, File A, No. 571, 577, S. G. O. Official Report of Major General G. B. McClellan, U. S. A., and Ben. Huger, C. S. A. Also designated King's School House and The Orchards.
June 25th..	Germantown, Tennessee.....	56th Ohio Volunteers guarding railroad train.....	10	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 337.
June 25th..	Little Red River, Arkansas.....	4th Iowa Cavalry.....	.....	2	4	.....	.....	.....	
June 26th, 27th, 28th, and 29th.	Vicksburg, Mississippi.....	U. S. Fleet, commanded by Commodore D. G. Farragut.	.....	.....	.....	.....	.....	.....	Official Reports.
June 26th..	Mechanicsville, Virginia.....	Fifth Corps, and McCall's Division of the First Corps, Army of the Potomac, Major General Fitz-John Porter.	.....	400	.....	.....	.....	3,000*	Official Report of Major General G. B. McClellan. First of the seven-days battles. Also known as Ellison's Mills. Among the casualties were Brigadier General G. E. Pickett, C. S. A., wounded.
June 27th..	Williams Bridge, Amite River, Louisiana.	21st Indiana Volunteers.....	2	4	.....	4	.....	7	Official Report of Lieutenant Colonel J. A. Keith, 21st Indiana Volunteers.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1862.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS. Killed.	Wounded.	Missing.	CONFED. LOSS. Killed.	Wounded.	Missing.	REMARKS AND REFERENCES.
June 26th to July 1st.	Seven-days' Retreat	First Corps, Brigadier General McCall's Division	253	1,240	1,581	187	803	360	Major General B. Huger's Division.
		Second Corps, Major General E. V. Sumner	187	1,076	848	258	1,495	30	Major General B. Magruder's Division.
		Third Corps, Major General S. P. Heintzleman	189	1,051	833	763	3,929	239	Major General J. Longstreet's Division.
		Fourth Corps, Major General E. D. Keyes	69	507	201	619	3,251	.....	Major General A. P. Hill's Division.
		Fifth Corps, Major General Fitz-John Porter	620	2,460	1,198	966	4,417	63	Major General T. J. Jackson's Division.
		Sixth Corps, Major General W. B. Franklin	245	1,313	1,179	2	52	.....	Major General T. H. Holmes's Division.
		Cavalry, commanded by Brigadier General Stoneman	19	60	97	15	39	60	Major General J. E. B. Stuart, com'g Cavalry.
		Engineers	.....	2	21	10	34	.....	Brig. General W. N. Pendelton, Chief of Artillery.
		Army of the Potomac, Major General G. B. McClellan, commanding.	1,582	7,709	5,958	2,820	14,011	752	Army of Northern Virginia, Lieutenant General R. E. Lee, commanding.
									The losses are compiled from official reports, Union and Confederate, and includes the battles of Mechanicsville, June 26th, Gaines's Mills, June 27th, Chickahominy, June 28th, Peach Orchard and Savage Stations, June 29th, Charles City Cross Roads, June 30th, and Malvern Hill, July 1st.
June 27th..	Swift Creek Bridge, North Carolina	.....	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 33.
June 27th..	Village Creek, Arkansas	9th Illinois Cavalry	2	30	.....	.....	.....	.....	Report of Adjutant General of Illinois, Vol. 3, page 96. Also known as Stewart's Plantation.
June 27th..	Gaines' Mill, Virginia	Fifth Corps, Army of the Potomac, commanded by Major General Fitz-John Porter, reinforced by Meagher's and French's Brigades, 1st Division, Second Corps.	.....	.....	.....	.....	.....	.....	Appendix to Part I, Medical and Surgical History of the War, pages 44, 72, 76, and 82. Partial list of casualties and wounded prisoners, S. G. O. Also known as Cold Harbor and Chickahominy. Brigadier General R. Griffith, C. S. A., was killed.
June 27th..	Waddell's Farm, Arkansas	Detachment of 3d Iowa Cavalry, guarding wagon train.	4	4	.....	.....	.....	.....	Official Report of Colonel Cyrus Bussey.
June 28th..	Golding's Farm, Virginia	23d and 49th New York Volunteers and 3d New York Battery.	.....	.....	.....	.....	.....	.....	Official Report of Major General G. B. McClellan.
June 29th..	Willis Church, Virginia	Cavalry advance of Casey's Division, Fourth Corps	.....	.....	.....	2	15	46	Official Report of Lieutenant Colonel Bowers, 1st North Carolina Cavalry, C. S. A.
June 29th..	Peach Orchard, Virginia	Richardson's and Sedgwick's divisions of the Second Corps, Army of the Potomac.	.....	.....	.....	.....	.....	.....	Also known as Allen's Farm. Official Report of Major General G. B. McClellan.
June 29th..	Savage's Station, Virginia	Second and Sixth Corps, Army of the Potomac, commanded by Generals Sumner and Franklin.	.....	.....	.....	.....	.....	.....	Among the casualties were Brigadier Generals Brook and Burns wounded.
June 30th.	White Oak Swamp, Virginia	Second (Sumner's), Third (Heintzleman's), Fourth (Keyes'), Fifth (Porter's), Sixth (Franklin's), and McCall's Division of the First Corps, Army of the Potomac.	.....	.....	.....	.....	.....	.....	Official reports. Appendix to Part I, Medical and Surgical History of the War, page 44. Also known as Glendale, Charles City Cross Roads, Nelson's Farm, Frazier's Farm, Turkey Bend, and New Market Cross Roads. Among the casualties were Major General Sumner and Brigadier General Meade, of the Union Army, and Brigadier Generals J. R. Anderson, W. S. Featherstone, and Pender, of the Confederate Army, wounded.
June 30th..	Turay, Virginia	Detachment of cavalry of Brigadier General Crawford's command.	1	3	.....	.....	.....	4	

July 1st...	Malvern Hill, Virginia	Second, Third, Fourth, Fifth, and Sixth Corps, Army of the Potomac.	.....	.....	.....	.....	.....	List of casualties, File A, No. 547, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 44. Official reports. Also known as Crew's Farm.
July 1st...	Booneville, Mississippi	2d Iowa and 2d Michigan Cavalry	.....	45†	.....	17	.....	65§	Adjutant General's Report, Iowa, 1863, page 854.
July 1st...	Morning Sun, Tennessee	57th Ohio Volunteers	.....	4	.....	11	26	10	Ohio in the War, Vol. 2, page 343.
July 1st...	Russellville, Tennessee	1st Ohio Cavalry	.....	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 748.
July 2d....	Milford, Virginia	1st Maine Cavalry	.....	.....	.....	.....	.....	.....	Adjutant General's Report, Maine, 1862.
July 3d....	Haxals, Virginia	14th Indiana, 7th West Virginia, and 4th and 8th Ohio Volunteers.	8	32	.....	.....	.....	100*	Casualty List, File A, No. 593, S. G. O. Official Report of J. E. B. Stuart, C. S. A. Also called Evlington Heights.
July 4th...	Grand Haze, White River, Arkansas	13th Illinois Cavalry	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 37.
July 5th...	Sperryville, Virginia	1st Maine Cavalry	.....	.....	.....	.....	.....	.....	Maine Adjutant General's Report, 1862, page 95.
July 6th...	Grand Prairie, near Aberdeen, Arkansas	24th Indiana Volunteers	1	21	.....	.....	.....	84*	Official Report of Colonel G. N. Fitch.
July 7th...	Bayou Cache, Arkansas	11th Wisconsin, 33d Illinois, and 8th Indiana Volunteers; 1st Missouri Light Artillery, and 1st Indiana and 5th and 13th Illinois Cavalry.	7	57	.....	110	.....	200§	Official Report of Colonel C. E. Hovey. Also known as Cotton Plant, Round Hill, Bayou De View, and Hill's Plantation.
July 8th...	Black River, Missouri	5th Kansas Cavalry	1	3	.....	.....	.....	.....	Official.
July 8th...	Lotspeach Farm, Missouri	One company 1st Iowa Cavalry	.....	.....	.....	.....	.....	.....	Iowa Adjutant General's Report, 1863, Vol. II, page 846.
July 9th...	Clinton, Missouri		1	2	.....	.....	.....	.....	
July 9th...	Hamilton, North Carolina	U. S. gunboats Perry, Ceres, and Shawseen, and 9th New York Volunteers.	1	20	.....	.....	.....	.....	
July 9th...	Aberdeen, Arkansas	24th, 34th, 43d, and 46th Indiana Volunteers, commanded by Colonel Fitch, 46th Indiana Volunteers.	.....	.....	.....	.....	.....	.....	Indiana Adjutant General's Report.
July 9th...	Tompkinsville, Kentucky	3d Pennsylvania Cavalry	4	6	19	.....	.....	10*	Official. Morgan's raid.
July 10th..	Scatterville, Arkansas	Detachment of 1st Wisconsin Cavalry	.....	.....	.....	.....	.....	.....	
July 11th..	Williamsburg, Virginia		.....	.....	.....	3	.....	7	Rebellion Record, Vol. V, page 38.
July 11th..	Pleasant Hill, Missouri	1st Iowa Cavalry and Missouri Militia	10	19	.....	6	5	.....	Iowa Adjutant General's Report, 1863, Vol. II, page 846.
July 11th..	New Hope, Kentucky	33d Ohio Volunteers	.....	.....	.....	.....	.....	.....	Official Report of Lieutenant Colonel O. F. Moore, 33d Ohio Volunteers, commanding.
July 12th.	Lebanon, Kentucky	Lebanon Home Guards and 28th Kentucky Volunteers	2	.....	65	.....	.....	.....	Official Report of Acting Brigadier General John H. Morgan, C. S. A. Morgan's raid.
July 12th..	Near Culpeper, Virginia	1st Maryland, 1st Vermont, 1st West Virginia, and 5th New York Cavalry.	.....	.....	.....	1	5	11	
July 13th..	Fairfax, near Rapidan Railroad Bridge, Virginia	1st Maryland Cavalry	.....	.....	.....	.....	.....	.....	Official.
July 13th.	Murfreesboro', Tennessee	9th Michigan and 3d Minnesota Volunteers; 4th Kentucky and 7th Pennsylvania Cavalry, and 1st Kentucky Battery.	33	62	800	50	100	.....	Official Report of Colonel W. W. Duffield, 9th Michigan Volunteers.
July 14th..	Batesville, Arkansas	4th Iowa Cavalry	1	4	3	.....	.....	.....	Official.
July 15th.	Attempt to destroy the Rebel ram Arkansas.	Carondelet, Queen of the West, Tyler, and Essex, and 4th Wisconsin Volunteers.	13	36	.....	5	9	.....	Official Report of Commander W. D. Porter, U.S.N.

* Killed, wounded, and missing. † Killed and wounded. § Wounded and missing.

DATE. 1862.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
July 15th..	Apache Pass, Arizona Territory	2d California Cavalry	.....	1	.....	.....	.....	.....	
July 15th..	Fayetteville, Arkansas	Union troops, commanded by Major W. H. Miller, 2d Wisconsin Cavalry	.....	.....	.....	.....	.....	150	
July 15th..	Near Decatur, Tennessee	Detachment of 1st Ohio Cavalry	.....	4	2	.....	.....	.....	Ohio in the War, Vol. 2, p. 748.
July 17th..	Cynthiana, Kentucky	18th Kentucky Volunteers, Cynthiana, Newport, Cincinnati, and Bracken County Home Guards, and 7th Kentucky Cavalry.	17	34	.....	8	29	.....	Official Report of Colonel J. J. Landran, 18th Kentucky, and Acting Brigadier General John H. Morgan, C. S. A. Morgan's raid.
July 18th..	Memphis, Missouri	2d Missouri Cavalry and 9th and 11th Missouri S. M.	13	35	.....	23	.....	.....	Missouri Adjutant General's Report, 1865, p. 319.
July 20th..	Turkey Island Bridge, Virginia	8th Pennsylvania Cavalry	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 45.
July 20th..	Pittman's Ferry, Arkansas	13th Illinois Cavalry	.....	.....	.....	.....	.....	.....	Illinois Adjutant General's Report, Vol. 3, p. 145.
July 21st..	Nashville, Tennessee	2d Kentucky Volunteers	.....	.....	.....	.....	.....	.....	Kentucky Adjutant General's Report.
July 23d...	Florida, Missouri	Two companies 3d Iowa Cavalry	.....	22	2	3	.....	.....	Iowa Adjutant General's Report, 1863, page 856, Also called Boles' Farm.
July 23d...	North Anna River, Virginia	2d New York and 3d Indiana Cavalry	.....	.....	.....	.....	.....	.....	Official Report of Major Gen. John Pope, U. S. A.
July 23d...	Columbus, Missouri	7th Missouri Cavalry	.....	2	.....	.....	.....	.....	Official.
July 24th..	Coldwater, Mississippi		.....	.....	.....	.....	.....	.....	
July 24th..	Trinity, Alabama	Co. E, 31st Ohio Volunteers	2	11	.....	12	30	.....	Official Report of Colonel M. B. Walker, 31st Ohio Volunteers. Casualty List, File A. No. 570, S. G. O.
July 24th..	Botts' Farm, Monroe County, Missouri	3d Iowa Cavalry	1	9	.....	1	12	.....	Iowa Adjutant General's Report, 1863, page 856.
July 24th and 25th.	Santa Fé, Missouri	3d Iowa Cavalry	2	13	.....	.....	.....	.....	Official.
July 25th..	Brownsville, Hatchie River, Tennessee	Cavalry, commanded by Major Wallace	.....	.....	.....	.....	.....	.....	
July 25th..	Orange Court-House, Virginia	Reconnointering expedition from General Gibson's Divison.	.....	.....	.....	.....	.....	.....	Official Report of Major General Pope.
July 25th and 26th.	Mountain Store and Big Piney, Missouri	Three companies 3d Missouri Cavalry and Battery L, 2d Missouri Artillery.	.....	.....	.....	5	.....	15	
July 25th..	Courtland Bridge, Alabama	Two companies 10th Kentucky Volunteers and two companies 1st Ohio Cavalry.	.....	.....	100	.....	.....	.....	Kentucky Adjutant General's Report, Vol. 1, page 819.
July 26th..	Patten, Missouri	Missouri Militia	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 48.
July 26th..	Young's Cross Roads North Carolina	9th New Jersey Volunteers and 3d New York Cavalry	.....	7	.....	4	18	18	New Jersey and the Rebellion, page 215.
July 26th..	Greenville, Missouri	3d and 12th Missouri Militia Cavalry	2	5	.....	.....	.....	.....	Official.
July 26th..	Buchannon, West Virginia		.....	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 487.
July 27th..	Brown Springs, Missouri	2d Iowa Cavalry	.....	.....	.....	.....	.....	.....	Iowa Adjutant General's Report, 1863, page 856.
July 28th..	Bayou Barnard, Cherokee Nation	1st, 2d, and 3d Kansas Indian Home Guards, and 1st Kansas Battery.	.....	.....	.....	.....	.....	.....	Official. Colonel W. A. Phillips, 3d Kansas Indian Home Guards, commanding.

July 28th.	Moore's Mills, Fulton County, Missouri.	3d Iowa Cavalry, 2d Missouri Cavalry, 9th Missouri Volunteers, and 3d Indiana Battery.	19	21	.....	30	100	.....	Iowa Adjutant General's Report, 1863, page 856.
July 29th.	Mount Sterling, Kentucky	18th Kentucky and Home Guards	.....	.....	.....	.....	.....	.....	Official.
July 29th.	Bollinger's Mills, Missouri	Two companies of the 13th Missouri Volunteers	.....	.....	.....	10	.....	.....	Official Report of Colonel B. T. Lazar, 1st Missouri Militia Cavalry.
July 29th.	Russellville, Kentucky	Russellville Home Guards and 70th Indiana Volunteers.	.....	1	.....	.....	.....	.....	Adjutant General's Report, Indiana, Vol. 2, p. 645.
July 29th.	Brownsville, Tennessee	One company of the 15th Illinois Cavalry, commanded by Captain J. J. Bollins.	4	6	.....	4	6	.....	Rebellion record, Vol. V, page 50.
July 30th.	Paris, Kentucky	9th Pennsylvania Cavalry	.....	.....	.....	27	39	.....	Newspaper statement.
July 31st.	Coggin's Point, opposite Harrison's Landing, Virginia.	Gunboat fleet	10	15	.....	1	6	.....	Official Report of Lieutenant General R. E. Lee, C. S. A., and Major General McClellan, U. S. A.
Aug. 1st.	Newark, Missouri	Seventy-three men of the 11th Missouri State Militia.	4	4	60	.....	.....	73*	Official.
Aug. 2d.	Ozark, Missouri	14th Missouri Militia	.....	1	.....	3	7	.....	Confederate official reports. Also known as Forsythe.
Aug. 2d.	Orange Court-House, Virginia	5th New York Cavalry and 1st Vermont Cavalry	4	12	.....	11	.....	52	Official Report Major General John Pope, U. S. A.
Aug. 2d.	Clear Creek, Missouri	Four companies 1st Iowa Cavalry	5	14	.....	11	.....	.....	Iowa Adjutant General's Report, 1863, Vol. II, pages 846, 849. Also called Taberville.
Aug. 2d.	Coahoma County, Mississippi	11th Wisconsin Volunteers	.....	5	.....	.....	.....	.....	Official.
Aug. 2d.	Austin, Tunica County, Mississippi	8th Indiana Volunteers	.....	.....	.....	.....	.....	.....	Official.
Aug. 3d.	Sycamore Church, near Petersburg, Va.	5th U. S and 3d Pennsylvania Cavalry, commanded by Colonel Averill.	.....	2	.....	.....	6	2	Official Report of Major General G. B. McClellan.
Aug. 3d.	Chariton Bridge, Dodge County, Missouri.	6th Missouri Cavalry	.....	2	.....	11	4	17	Official.
Aug. 3d.	Jonesboro', Arkansas	1st Wisconsin Cavalry	4	2	21	.....	.....	.....	Official.
Aug. 3d.	Languelle Ferry, Arkansas	1st Wisconsin Cavalry	17	38	8	.....	.....	.....	Official.
Aug. 4th.	Sparta, Tennessee	Detachments of the 4th Kentucky and 7th Indiana Cavalry.	1	.....	1	.....	.....	.....	Official Report of Colonel Wynkoop.
Aug. 4th.	White Oak Swamp Bridge, Virginia	3d Pennsylvania Cavalry, Colonel Averill, commanding.	.....	.....	.....	.....	10	28	Official Report.
Aug. 5th.	Baton Rouge, Louisiana	14th Maine, 6th Michigan, 7th Vermont, 21st Indiana, 30th Massachusetts, 9th Connecticut, and 4th Wisconsin Volunteers, and 2d, 4th, and 6th Massachusetts Batteries, commanded by Brigadier General Thomas Williams.	82	255	34	84	316	78	Appendix to Part I, of the Medical and Surgical History of the War, page 235. Official Reports of Colonel Thomas Cahil, U. S. V., and Maj. Gen. J. C. Breckenridge, C. S. A. Brigadier General Thomas Williams. U. S. V., killed.
Aug. 5th.	Malvern Hill, Virginia	Portion of Hooker's Division, Third Corps, and Richardson's Division, Second Corps, and Cavalry, Army of the Potomac.	3	11	.....	.....	.....	100	Official Reports of Generals McClellan, commanding the Union forces, and Lee, commanding the Confederate forces. Casualty Lists, File A, No. 571, S. G. O.
Aug. 6th.	Montavallo, Missouri	3d Wisconsin Cavalry	.....	1	3	.....	.....	.....	Wisconsin Adjutant General's Report, 1865, p. 618. Also known as Church in the Woods.
Aug. 6th.	Beech Creek, West Virginia	4th West Virginia Volunteers	3	8	4	1	11	.....	Report of Adjutant General of West Virginia, 1864, page 104.
Aug. 6th.	Kirksville, Adair County, Missouri	Missouri Militia, commanded by Colonel John McNeill.	28	60	.....	128	200	40	Official Report of Major General Schofield, U. S. A.
Aug. 6th.	Matapony, Virginia	Portion of King's Division, commanded by Colonel Cutler.	1	12	72	.....	.....	.....	Wisconsin Adjutant General's Report, 1865, p. 53. Also called Thornburg.

* Killed, wounded, and missing.

DATE. 1862.	LOCALITY.	UNION TROOPS ENGAGED	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Aug. 6th...	Tazewell, Tennessee	16th and 42d Ohio and 14th and 22d Kentucky Volunteers, and 4th Wisconsin Battery.	3	23	50	9	40	.....	Official Report of Brigadier General George W. Morgan.
Aug. 7th...	Fort Fillmore, New Mexico	California troops, commanded by General Canby	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 55.
Aug. 7th...	Trenton, Tennessee	2d Illinois Cavalry	.....	.....	.....	30	20	.....	Rebellion Record, Vol V, page 55.
Aug. 8th...	Panther Creek, Missouri	1st Missouri Militia Cavalry	1	4	.....	.....	.....	.....	Official.
Aug. 9th...	Stockton, Missouri	Colonel McNiel's command of Missouri State Militia	.....	.....	.....	13	.....	36	Official.
Aug. 9th...	Cedar Mountain, Virginia	Second Corps, Major General N. P. Banks, and Third Corps, Major General I. McDowell, Army of Virginia, commanded by Major General John Pope.	450	660	290	229	1,047	31	Appendix to Part I, Medical and Surgical History of the War, page 108. Official Reports of Major General John Pope, U. S. A., and Lieutenant General T. J. Jackson, C. S. A. Among the casualties were Brig. Gen's Augur, Carroll, and Geary, of the Union Army, wounded, and Brigadier General C. S. Winder, C. S. A., killed. Also known as Slaughter Mountain, Southwest Mountain, Cedar Run, and Mitchell's Station.
Aug 10th to 13th.	Grand River, Missouri	9th Missouri Militia, commanded by Colonel Odin Guitar.	.....	.....	100*	.....	.....	.....	Official. Includes Lee's Ford, Chariton River, Walnut Creek, Compton Ferry, Switzler's Mills, and Yellow Creek.
Aug. 10th..	Nueces River, Texas	Texas loyalists	40	.....	.....	8	14	.....	Lossing's Civil War in America, Vol. II, page 537.
Aug. 11th..	Taberville, Arkansas	1st Missouri and 3d Wisconsin Cavalry	.....	.....	6	.....	.....	.....	Adjutant General's Report of Wisconsin, 1865, page 618.
Aug. 11th..	Independence, Missouri	7th Missouri Militia Cavalry	14	18	312	.....	.....	.....	Official Report of Lieutenant Colonel J. T. Buell.
Aug. 11th to 14th.	Helena, Arkansas	2d Wisconsin Cavalry	1	2	4	.....	.....	.....	Official.
Aug. 11th..	Salisbury, Tennessee	11th Illinois Cavalry	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 58.
Aug. 11th..	Williamsport, Tennessee	.....	.....	.....	.....	.....	.....	.....	Official Dispatch of Brigadier General James S. Negley.
Aug. ——	Wyoming Court-House, West Virginia	Detachment of the 37th Ohio Volunteers	2	.....	7	.....	.....	.....	Ohio in the War, Vol. 2, page 240.
July 20th to Sept. 20th.	Guerilla campaign in Missouri	Major General Schofield's command	77	156	347	506	1,800	560	Official Report. Includes all the engagements with Porter's, Poindexter's Guerillas.
Aug. 11th..	Kinderhook, Tennessee	Detachments of the 3d Kentucky and 1st Tennessee Cavalry.	3	.....	.....	7	.....	27	Official Report of Brigadier General J. S. Negley, U. S. V.
Aug. 12th.	Galatin, Tennessee	2d Indiana, 4th and 5th Kentucky, and 1st Pennsylvania Cavalry.	30	50	200	6	18	.....	Official Report of Colonel John H. Morgan, C. S. A. Brigadier General R. W. Johnson, commanding the Nationals, was wounded, and the post captured. The Confederates were driven from the town on the 13th by the 69th Ohio and 11th Michigan Volunteers with slight loss.
Aug. 13th..	Clarendon, Arkansas	Brigadier General Hovey's Division, Thirteenth Corps.	.....	.....	.....	.....	.....	700	
Aug. 15th..	Merriweather's Ferry, Obion River, Tennessee.	One company 2d Illinois Cavalry	3	6	.....	20	.....	9	Official.

Aug. 16th..	Lone Jack, Missouri	Missouri Militia Cavalry, commanded by Major E. S. Foster, 7th Militia Cavalry.	60	100			110†	Official Report of Major General J. M. Schofield, U. S. A.
Aug. 18th..	Capture of rebel steamer Fair Play, near Milliken's Bend, Louisiana.	58th and 76th Ohio Volunteers					40	Ohio in the War, Vol. 2, pages 350 and 440.
Aug. 18th.	Redwood, Minnesota	One company 5th Minnesota Volunteers	23	4				Massacred by Indians.
Aug. 19th.	Clarksville, Tennessee	71st Ohio Volunteers, commanded by Colonel R. Mason.			200			Official Report. The post was surrendered without an engagement.
Aug. 19th..	Rienzi, Mississippi							
Aug. 19th..	White Oak Ridge, near Hickman, Kentucky.	2d Illinois Cavalry, commanded by Captain F. Moore		2		4	19	
Aug. 20th..	Brandy Station, Virginia	Cavalry of Army of Virginia				3	12	Official Report of Major General Pope.
Aug. 20th..	Edgefield Junction, Tennessee	Detachment of the 50th Indiana Volunteers				8	18	Indiana Adjutant General's Report, Vol. 2, p. 500.
Aug. 20th..	Union Mills, Missouri	1st Missouri and 13th Illinois Cavalry	4	3		1	4	Official.
Aug. 20th and 22d.	Fort Ridgely, Minnesota	Companies B and C, 5th Minnesota Volunteers, and Renville Rangers.	3	13				Fight with Indians.
Aug. 21st..	Kelly's Ford, Rappahannock River, Virginia.	Cavalry of Army of Virginia						Official Report of Major General Pope.
Aug. 21st..	Pinckney Island, South Carolina		3	3	32			Rebellion Record, Vol. V, page 63.
Aug. 22d..	Courtland, Tennessee	42d Illinois Volunteers		2	2	8		Unofficial.
Aug. 22d..	Crab Orchard, Kentucky	9th Pennsylvania Cavalry, commanded by Brigadier General G. C. Smith.						Rebellion Record, Vol. V, page 63.
Aug. 23d..	Catlett's Station, Virginia	Purnell Legion (Maryland) and 1st Pennsylvania Rifles.			300		1	Official.
Aug. 23d to 25th.	Skirmishes on the Rappahannock, at Waterloo Bridge, Lee Springs, Freeman's Ford, and Sulphur Springs, Virginia.	Army of Virginia, commanded by Major General Pope				27	94	Official Reports of Major General John Pope, U. S. A., and Lieut. General R. E. Lee, C. S. A. Brigadier General Bohlen, U. S. V., was killed.
Aug. 23d..	Big Hill, Madison County, Kentucky	7th Kentucky Cavalry and 3d Tennessee Volunteers	10		40§	25		Tennessee Adjutant General's Report, 1866, p. 73.
Aug. 24th.	Dallas, Missouri	12th Missouri S. M. Cavalry	3	1				Official.
Aug. 24th..	Coon Creek, Missouri		2	22	6			Official. Also known as Lamar.
Aug. 25th..	Fort Donelson, Tennessee	71st Ohio Volunteers and 5th Iowa Cavalry		20†			30†	Iowa Adjutant General's Report, 1864, page 988.
Aug. 26th..	Cumberland Iron Works, Tennessee		3	8	10			Casualty List, S. G. O.
Aug. 25th and 26th.	New Ulm, Minnesota		10	50				Official Report of Captain C. F. Flandrau. Indian fight.
Aug. 25th.	Bloomfield, Missouri	13th Illinois Cavalry					20†	Rebellion Record, Vol. V, page 65.
Aug. 26th.	Madisonville, Kentucky	Cavalry, commanded by Lieutenant Colonel Foster						Official.
Aug. 26th.	Rienzi and Kossuth, Mississippi	2d Iowa and 7th Kansas Cavalry	5	12	6			Iowa Adjutant General's Report, 1863, page 854.
Aug. 26th.	Danville, Kentucky	Harrodsburg and Danville (Kentucky) Home Guards	1	2		3	5	36 Newspaper report.
Aug. 27th.	Bull Run Bridge, Virginia	11th and 12th Ohio and 1st, 2d, 3d, and 4th New Jersey Volunteers.						Official. Brigadier General G. W. Taylor, commanding Union troops, was mortally wounded.
Aug. 27th..	Kettle Run, Virginia	Major General Hooker's Division, Third Corps, Army of the Potomac.		300†			300†	Appendix to Part I, Medical and Surgical History of the War, page 108.
Aug. 27th..	Fort McCook, near Bridgeport Alabama	33d Ohio Volunteers and detachment of cavalry						Ohio in the War, Vol. 2. page 219.

* Killed, wounded, and missing. † Killed and wounded. § Wounded and missing.

DATE. 1862.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Aug. 28th..	Readyville, Tennessee	10th Brigade, Army of the Ohio, commanded by Colonel W. Grose.	.....	5	.....	.....	.....	.....	Official. Also known as Round Hill.
Aug. 28th..	Howard County, Missouri	4th Missouri Militia Cavalry	8	2	1	.....	.....	.....	Official.
Aug. 28th..	Shady Springs, Virginia	2d West Virginia Cavalry	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 66.
Aug. 29th..	Manchester, Tennessee	Two companies 18th Ohio and one company of the 9th Michigan Volunteers.	.....	.....	.....	.....	.....	100*	Ohio in the War, Vol. 2, page 130.
Aug. 28th and 29th.	Groveton and Gainesville, Virginia	First Corps, Major General F. Sigel, and Third Corps, Major General I. McDowell, Army of Virginia; Hooker's and Kearney's Divisions of the Third Corps and Reynolds' Division of the First Corps, Army of the Potomac, and Ninth Corps, Major General Reno.	.....	.....	7,000*	.....	.....	7,000*	Appendix to Part I, Medical and Surgical History of the War, page 108. Official Reports of Major General John Pope, U. S. A., and Lieutenant General R. E. Lee, C. S. A. Among the wounded were Major General Ewell and Brigadier General Taliaferro, C. S. A.
Aug. 30th..	Bull Run (2d), Virginia	First Corps, Major General F. Sigel, and Third Corps, Major General I. McDowell, Army of Virginia; Hooker's and Kearney's Divisions, Third Corps, Porter's, Fifth Corps, and Reynolds' Division, First Corps, Army the Potomac, and Ninth Corps, Major General Reno.	800	4,000	3,000	700	3,000	.....	Casualty List, Nos. 229, 445, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 108. Official Reports of Major General John Pope, U. S. A., and Lieutenant General R. E. Lee, C. S. A. Among the wounded were Brigadier Generals Tower and Schenck, U. S. V., and Field, Trimble, Jenkins, and Mahone, C. S. A. Also known as Manassas.
Aug. 30th..	Bolivar, Tennessee	2d and 11th Illinois Cavalry, 9th Indiana Artillery, and 78th and 20th Ohio Volunteers.	5	18	64	.....	100†	.....	Official Report of Colonel M. M. Crockett, 13th Iowa Volunteers.
Aug. 23d to Sept. 1st.	Pope's campaign in Virginia		.....	.....	7,000	1,500	8,000	.....	Official Reports of Lieutenant General R. E. Lee, C. S. A.
Aug. 30th.	McMinnville, Tennessee	26th Ohio and 17th and 58th Indiana Volunteers and 8th Indiana Battery.	.....	.....	.....	1	20	.....	Official. Also known as Little Pond.
Aug. 30th..	Richmond, Kentucky	6th and 7th Kentucky Cavalry; 95th Ohio, 18th Kentucky, 12th, 16th, 55th, 66th, 69th, and 71st Indiana Volunteers; and Batteries D and G, Michigan Artillery.	200	700	4,000	250	500	.....	Casualty List. S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 246.
Aug. 31st..	Weston, West Virginia	Two companies 6th West Virginia Volunteers	.....	6	.....	.....	.....	.....	Report of Adjutant General of West Virginia, 1864, page 190.
Aug. 31st..	Medon Station, Mississippi Central Railroad, Tennessee.	45th Illinois and 7th Missouri Volunteers	3	13	43	.....	.....	.....	Official Report of Brigadier General L. T. Ross. Also known as Toon's Station.
Aug. 31st..	Stevenson, Alabama		.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 69.
Aug. 31st..	Yates' Ford Kentucky	94th Ohio Volunteers	3	10	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 524.
Sept. 1st...	Britton's Lane, near Denmark, Tenn.	20th and 30th Illinois Volunteers, Battery A, 2d Illinois Artillery, 4th Illinois Cavalry, and Foster's Company of Ohio Cavalry.	5	51	52	179	100	.....	Official Report of Brigadier General Leonard T. Ross.
Sept. 1st...	Chantilly, Virginia	McDowell's Corps, Army of Virginia; Hooker's and Kearney's Divisions. Third Corps, Army of the Potomac, and Reno's Corps.	.....	.....	1,300*	.....	.....	800*	Official Reports. Major General Philip Kearney and Brigadier General I. I. Stevens killed. Also known as Ox Hill.
Sept. 2d...	Morgansville, Kentucky	A force of Union troops commanded by Colonel Schackleford, 8th Kentucky Cavalry.	.....	2	.....	8	.....	.....	Rebellion Record, Vol. V, page 70.

Sept. 2d...	Plymouth, North Carolina	Co. F, 9th New York Volunteers, and 1st North Carolina.	3			30		40	Newspaper statements.
Sept. 2d...	Vienna, Virginia	1st Minnesota Volunteers	1	6	1				Official.
Sept. 2d and 3d.	Birch Coolie, Minnesota		15	34					Official. Indian fight. Also known as Acton.
Sept. 3d and 4th.	Hutchinson, Minnesota								Fight with Indians.
Sept. 3d...	Slaughterville, Kentucky	Lieutenant Colonel Foster's Cavalry				3	2	25	Rebellion Record, Vol. V, page 71.
Sept. 3d...	Geiger Lake, Kentucky	8th Kentucky Cavalry							Kentucky Adjutant General's Report, page 229.
Sept. 3d to 6th.	Fort Abercrombie, Dakota Territory		1	2					
Sept. 4th...	Big Creek Gap, Tennessee	Detachment of the 6th Tennessee Volunteers							Tennessee Adjutant General's Report, 1866, p. 132.
Sept. 6th..	Cacapon Bridge, Virginia	1st New York Cavalry							Unofficial.
Sept. 6th..	Martinsburg, Virginia		2	10				50	Official Report of Brigadier General Julius White.
Sept. 6th..	Washington, North Carolina	1st North Carolina and 24th Massachusetts Volunteers and 3d New York Cavalry.	8	36		30	100	36	Newspaper report.
Sept. 6th..	La Grange, Arkansas	1st Missouri Cavalry	1	1					Official.
Sept. 7th...	Poolesville, Maryland	3d Indiana and 8th Illinois Cavalry	2	6		3	6	9	Official.
Sept. 7th..	Clarksville, Tennessee	11th Illinois, 13th Wisconsin, and 71st Ohio Volunteers; 5th Iowa Cavalry and two batteries.							Report of Adjutant General of Wisconsin, 1865, page 218. Also known as Rickett's Hill.
Sept. 9th..	Columbia, Tennessee	42d Illinois Volunteers				18	45		Illinois Adjutant General's Report, Vol. I, page 652.
Sept. 9th..	Nolansville, Maryland	3d Indiana and 8th Illinois Cavalry		1		3			Official.
Sept. 9th..	Williamsburg, Virginia	5th Pennsylvania Cavalry			30	9			Rebellion Record, Vol. V, page 76.
Sept. 9th..	Des Allemands, Louisiana	21st Indiana and 4th Wisconsin Volunteers				12		25	Indiana Adjutant General's Report, Vol. I, p. 208.
Sept. 10th	Cold Water, Mississippi	Cavalry, commanded by Colonel Grierson, 6th Illinois Cavalry.				4	80		Also known as Coehran's Cross Roads.
Sept. 10th	Sugar Loaf Mountain, Maryland	6th U. S. Cavalry							Official.
Sept. 10th.	Fayetteville, West Virginia	34th and 37th Ohio and 4th West Virginia Volunteers	13	80	36				Official Report of Colonel John T. Toland, 34th Ohio Volunteers.
Sept. 11th to 13th.	Bloomfield, Missouri	Battery E, 2d Missouri Artillery, 13th Illinois Vols., 1st Wisconsin Cavalry, and Missouri Militia	3	5					Official.
Sept. 11th	Cotton Hill, West Virginia	34th and 37th Ohio and 4th West Virginia Volunteers							Ohio in the War, Vol. 2, page 241.
Sept. 12th.	Charlestown, near Elk River, West Virginia.	34th Ohio and 4th West Virginia Volunteers							Official.
Sept. 12th	Frederick, Maryland	Advance of the Army of the Potomac							Official.
Sept. 12th to 15th.	Harper's Ferry, Virginia	12th New York State Militia, 39th, 111th, 115th, 125th, and 126th New York, 32d, 60th, and 87th Ohio, 9th Vermont, 65th Illinois, 1st and 3d Maryland (Home Brigade), and 15th Indiana Volunteers, Phillip's battery 5th New York Artillery Graham's, Potts's, and Rigby's Batteries, and 8th New York, 12th Illinois, and 1st Maryland Cavalry.	80	120	11,583		500†		Official Report of the Military Investigating Commission. Colonel Dixon H. Miles, U. S. A., commanding Union forces was mortally wounded.
Sept. 13th.	Newtonia, Missouri	3d and 6th Missouri Militia Cavalry	2		12				Official.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1862.	LOCALITY.	UNION TROOPS ENGAGED	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Sept. 14th.	Pouchatoula, Louisiana	12th Maine, 26th Massachusetts, and 13th Connecticut Volunteers.	.....	20	.....	.....	.....	.....	Official Report of Major General B. F. Butler.
Sept. 14th.	Turner's and Crampton's Gaps, South Mountain, Maryland.	Ninth Corps, Major General J. L. Reno; First Corps, Major General J. Hooker; and Sixth Corps Major General W. B. Franklin, Army of the Potomac, Major General G. B. McClellan commanding.	443	1,806	76	500	2,343	1,500	Casualty List, File A, No. 572, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 92. Official Reports of Union and Confederate. Among the casualties were Brigadier General R. E. Garland, C. S A., and Major General Jesse L. Reno, U. S. V. killed.
Sept. 14th to 16th.	Mumfordsville, Kentucky	18th U. S. Infantry, 28th and 33d Kentucky, 17th, 50th, 60th, 67th, 68th, 74th, 78th, and 89th Indiana Volunteers, and Conkle's Battery, 13th Indiana Artillery, and Louisville Provost Guard.	50	.....	3,566	.....	714†	.....	Official Report of Colonel J. T. Wilder.
Sept. 15th	Shelburne, Missouri	Missouri Militia, commanded by Colonel McNeil.	.....	.....	.....	2	.....	.....	Official.
Sept. 15th	Boonsboro', Maryland	Cavalry Army of Potomac	.....	.....	.....	.....	.....	250	Official.
Sept. 17th.	Durhamville, Tennessee	Detachment of the 52d Indiana Volunteers	1	10	1	8	10	.....	Report of Adjutant General of Indiana, Vol. I, page 522.
Sept. 17th.	Florence, Kentucky	Detachment of the 10th Kentucky Cavalry	1	1	.....	5	7	.....	Official.
Sept. 17th.	Goose Creek and Leesburg Road, Virginia.	Reconnoissance of Kilpatrick's brigade of Cavalry	.....	.....	.....	.....	.....	.....	Official.
Sept. 17th.	Antietam, Maryland	First Corps, Major General J. Hooker; Second Corps, Major General E. V. Sumner; Fifth Corps, Major General Fitz-John Porter; Sixth Corps, Major General W. B. Franklin; Ninth Corps, Major General A. E. Burnside; Twelfth Corps, Major General Williams; Couch's Division, Fourth Corps; and Pleasanton's Division of Cavalry—Army of the Potomac, commanded by Major General George B. McClellan.	2,010	9,416	1,043	3,500	16,399	6,000	Casualty List, File A, Nos. 571 and 284. Official Reports of Major General G. B. McClellan, U. S. A., and Lieutenant General R. E. Lee, C. S. A. Appendix to Part I, Medical and Surgical History of the War, page 92. Among the casualties in the Union Army were Brigadier General J. K. F. Mansfield, killed; Major Generals Richardson and Hooker, and Brigadier Generals Rodman, Weber, Sedgwick, Hartsuff, Dana, and Meagher, wounded; in the Confederate Army, Brigadier General L. O'B. Branch, G. B. Anderson, and W. E. Starke were killed, and Major General R. H. Andersen, Brigadier Generals Toombs, Lawton, Ripley, Rodes, Gregg, Armistead, and Ransom, wounded. Also known as Sharpsburg.
Sept. 19th.	Hickory Grove, Missouri	6th Kansas Cavalry	1	2	.....	.....	.....	.....	Official.
Sept. 19th and 20th.	Owensburg, Kentucky	14th Kentucky Cavalry and Spencer (Indiana) County Home Guards.	2	18	.....	.....	.....	.....	Official.
Sept. 19th and 20th.	Iuka, Mississippi	Stanley's and Hamilton's Divisions, Army of the Mississippi, commanded by Major General W. S. Rosecrans.	144	598	40	263	692	561	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 248. Official Reports Union and Confederate. Among the casualties were Confederate Brigadier Generals H. Little, killed, and Whitfield, wounded.
Sept. 20th.	Blackford's Ford, Sheppardstown, Va.	Griffin's and Barnes' Brigades, Fifth Corps	92	131	103	33	231	.....	Official.
Sept. 20th.	Shirley's Ford, Spring River, Missouri	2d Kansas Indian Home Guards	17	4	.....	.....	.....	60*	Official.
Sept. 20th.	Helena, Arkansas	4th Iowa Cavalry	1	.....	5	.....	.....	.....	Official.

Sept. 20th..	Williamsport, Maryland	Couch's Division, Army of the Potomac	2	10	8	.....	.....	10	Officia
Sept. 20th..	Prentis and Bolivar, Mississippi	U. S. ram Queen of the West, with transports and 33d Illinois.	.....	.....	.....	2	8	.....	Official.
Sept. 21st..	Cassville, Missouri	1st Arkansas Cavalry	.....	.....	.....	.....	.....	19	Rebellion Record, Vol. V, page 84.
Sept. 21st..	Mumfordsville, Kentucky	Cavalry commanded by Major Foster, 3d Ohio Cavalry.	2	12	.....	.....	.....	.....	Ohio in the War.
Sept. 21st..	Shepherdsville, Kentueky	Colonel Granger's command	.....	.....	.....	5	.....	28	Rebellion Record, Vol. V, page 84.
Sept. 22d ..	Sturgeon, Missouri	Major Hunt's command	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, age 84.
Sept. 23d ..	Ashby's Gap, Virginia	2d Pennsylvania and 1st West Virginia Cavalry	.....	.....	.....	.....	.....	3	
Sept. 23d ..	Yellow Medicine, Minnesota	3d, 6th, and 7th Minnesota Volunteers and Renville Guards.	4	40	.....	30	.....	.....	Colonel H. H. Sibley's official report. Also called Wood Lake.
Sept. 23d..	Wolf Creek Bridge, near Memphis, Miss.	57th Ohio Volunteers	.....	.....	.....	1	6	.....	Ohio in the War, Vol. 2, page 43.
Sept. 23d ..	Sutton, Virginia	10th West Virginia.	.....	.....	.....	.....	.....	.....	Newspaper report.
Sept. 26th..	Warrenton Junction, Virginia	Cavalry commanded by Colonel McLean	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 87.
Sept. 26th..	Cambridge, Missouri	9th Missouri Militia Cavalry	3	.....	.....	.....	.....	.....	
Sept. 27th..	Buffalo, West Virginia	34th Ohio	.....	.....	.....	7	.....	9	Rebellion Record, Vol. V, page 87.
Sept. 27th..	Augusta, Kentucky	Kentucky Home Guards	9	15	96	.....	.....	90*	Official.
Sept. 28th..	Blackwater, Virginia	1st New York Mounted Rifles	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 87.
Sept. 30th..	Newtonia, Missouri	1st brigade, Army of Kansas, 4th brigade, Missouri State Militia, commanded by Brigadier General F. Salomon and Colonel G. H. Hall, 4th Cavalry, Missouri State Militia.	50	80	115	220	280	.....	Official Report of Major General J. M. Schofield, U. S. V.
Sept. 30th..	Russellville, Kentucky	Union troops commanded by Colonel Harrison, 17th Kentucky.	.....	.....	.....	35	.....	10	Rebellion Record, Vol. V, page 88.
Oct. 1st....	Floyd's Fork, Kentueky	4th Indiana Cavalry, 34th Illinois and 77th Pennsylvania Volunteers. Colonel E. N. Kirk's brigade, Army of the Ohio.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Illinois, Vol. I, page 579.
Oct. 1st....	Gallatin, Tennessee	1st Tennessee Cavalry, commanded by Colonel Stokes	.....	.....	.....	40	.....	39	Newspaper report.
Oct. 1st....	Shepherdstown, Virginia	8th Illinois, 8th Pennsylvania, and 3d Indiana Cavalry, and Pennington's battery.	.....	12	3	60	.....	10	Official Report of Brigadier General Pleasanton, commanding.
Oct. 2d....	Olive Hill, Kentucky	Carter County Home Guards	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. V, page 90.
Oct. 2d....	Mount Washington, Kentucky	Advance of the Army of the Ohio	.....	.....	.....	.....	.....	.....	Official.
Oct. 2d....	Baldwin, Mississippi	Cavalry of the Army of the Mississippi	.....	.....	.....	.....	.....	.....	
Oct. 3d....	Reconnoissanee to Franklin, on the Blackwater, Virginia.	Union gunboats, commanded by Captain Flusser, and troops, commanded by General Spear.	.....	19†	.....	30	60	.....	Official.
Oct. 3d and 4th.	Corinth, Mississippi	McKean's, Davies', Hamilton's, and Stanley's Divisions, Army of the Mississippi, commanded by Major General W. S. Rosecrans.	315	1,812	232	594 1,423	2,162 5,692	2,102 2,248	Casualty Lists, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 248. Official Reports. Among the casualties were Brigadier Generals P. A. Hackleman, killed and Oglesby, wounded.
Oct. 4th....	Bardstown, Kentueky	Advance of the Army of the Ohio	.....	.....	.....	.....	.....	.....	Official.
Oct. 5th....	Big Hatchie River, Mississippi	Hurlbut's and Ord's Divisions, Army of the Mississippi.	.....	.....	500*	.....	.....	400	Casualty List, File A, No. 160, S. G, O. Appendix to Part I, Medical and Surgical History of the War, page 251. Official Report of Major General E. O. C. Ord. Also called Metamora.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1862.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Oct. 5th...	Glasgow, Kentucky	20th Kentucky Volunteers							Newspaper report.
Oct. 5th...	Madisonville, Kentucky	4th Indiana Cavalry							Report of Adjutant General of Indiana, Vol. III, page 19.
Oct. 6th...	Charleston, Virginia	6th U. S. Cavalry							Rebellion Record, Vol. V, page 93.
Oct. 6th...	Liberty and Sibley's Landing, Missouri	5th Missouri Militia Cavalry	1	1					Official.
Oct. 7th...	La Vergne, Tennessee	Palmer's Brigade	5	9	4		80†	175	Official Report of Brigadier General J. S. Negley.
Oct. 8th...	Perryville, Kentucky	First Corps, Major General A. McD. McCook, and Third Corps, Brigadier General C. C. Gilbert, Army of the Ohio, commanded by Major General D. C. Buell.	916	2,943	489	1,300	3,000	200 2,500*	Appendix to Part I, Medical and Surgical History of the War, page 251. Casualty Lists, S. G. O. Official Reports of Major General D. C. Buell. Among the casualties were Brigadier Generals J. S. Jackson and William R. Terrill, U. S. V., killed, and Wood, Cleburne, and Brown, C. S. A., wounded.
Oct. 9th...	Lawreneeburg, Kentucky	15th and 19th U. S. Infantry, 1st and 49th Ohio, Volunteers, Battery H, 5th U. S. Artillery, and 9th Kentucky Cavalry.	6	8		11			Casualty List, S. G. O. Official Reports. Also known as Dog Walk.
Oct. 9th...	Aldie, Virginia	Detachment of Cavalry from Major General Sigel's command.							Rebellion Record, Vol. V, page 93.
Oct. 10th..	Harrodsburg, Kentucky	Union troops, commanded by Lieutenant Colonel Boyle, 9th Kentucky Cavalry.						1,600	Adjutant General's Report of Kentucky, Vol. 1, page 251.
Oct. 10th..	Upper Missouri River, Arkansas			1					Indian fight.
Oct. 11th..	La Grange, near Helena, Arkansas	Detachment of the 4th Iowa Cavalry	4	13	9			9	Official.
Oct. 11th..	Cape Fear River, North Carolina	U. S. gunboat Maratanza	2	5					Official.
Oct. 11th..	Mouth of the Monocacy, Maryland	3d and 4th Maine Volunteers							Report of Adjutant General of Maine, 1862, pages 45 and 51.
Oct. 14th..	Stanford, Kentucky	Advance of the Army of the Ohio						14	Report of Adjutant General of Indiana, Vol. I, page 218. Also known as Lancaster.
Oct. 14th..	Hazel Bottom, Missouri		1		2				Official.
Oct. 15th..	Apalachicola River, Florida	Naval Expedition	7					2	Newspaper statement.
Oct. 15th..	Carsville, Virginia	One company of the 7th Pennsylvania Cavalry							Rebellion Record, Vol. VI, page 3.
Oct. 16th..	Charleston, Virginia	Reconnoissance of the Army of the Potomac	1	8				9	Newspaper report.
Oct. 17th..	Lexington, Kentucky	Detachments of the 3d and 4th Ohio Cavalry	4	24	350				Ohio in the War, Vol. II, page 766.
Oct. 17th..	Thoroughfare Gap, Virginia	Detachment of Cavalry from General Stahel's command						100	Newspaper report.
Oct. 18th..	Helena, Arkansas	Detachment of the 43d Indiana Volunteers	1		15				Unofficial.
Oct. 18th..	Haymarket, Virginia	Detachment of the 6th Ohio Cavalry	1	6	23				Ohio in the War, Vol. 2, page 791.
Oct. 20th..	Near Nashville, Tennessee	Union troops, commanded by Colonel Miller							Rebellion Record, Vol. VI, page 5.
Oct. 20th..	Anxvois River, Missouri	10th Missouri Militia Cavalry							

Oct. 20th..	Marshfield, Missouri	10th Illinois Cavalry	.....	.....	.....	.....	.....	27	Rebellion Record, Vol. VI, page 5.
Oct. 21st..	Lovettsville, Loudon County, Virginia..	Detachment of General Geary's brigade	1	4	.....	2	13	32	Newspaper statement.
Oct. 21st..	Woodville, Tennessee	2d Illinois Cavalry, commanded by Major Mudd	.....	.....	.....	.....	.....	40	
Oct. 21st..	Fort Cobb, Indian Territory	Loyal Indians	.....	.....	.....	.....	.....	.....	Newspaper report.
Oct. 22d..	Old Fort Wayne, Arkansas	1st division, Army of the Frontier, commanded by Brigadier General J. G. Blunt.	5	9	.....	.....	150†	.....	Official Report of Major General J. M. Schofield. Also known as Maysville.
Oct. 22d..	Hedgeville, Virginia	4th Pennsylvania Cavalry	.....	.....	.....	.....	.....	19	Rebellion Record, Vol. VI, page 6.
Oct. 22d..	Pocotaligo, South Carolina	47th, 55th, and 76th Pennsylvania, 48th New York, 6th and 7th Connecticut, 3d and 4th New Hampshire and 3d Rhode Island Volunteers, 1st New York Engineers, 1st Massachusetts Cavalry, and batteries D and M, 1st U. S., and E, 3d U. S. Artillery.	43	258	5	14	102	9	Official Reports of Brigadier Generals J. M. Brannan, U. S. V., and W. S. Walker, C. S. A. Also known as Yemassee.
Oct. 22d...	Waverly, Tennessee	83d Illinois Volunteers	1	2	.....	.....	40†	30	Report of Adjutant General of Illinois, Vol. II, page 292.
Oct. 23d...	Shelby Depot, Tennessee	Reconnoitering party, commanded by Col. D. Stuart, 55th Illinois Volunteers.	.....	.....	.....	8	.....	.....	Rebellion Record, Vol. VI, page 7.
Oct. 23d...	Point Lick and Big Hill Road, Kentucky.	Cavalry, commanded by Colonel E. McCook	.....	.....	.....	4	.....	.....	Unofficial.
Oct. 24th..	Manassas Junction, Virginia	.....	.....	.....	17	.....	.....	.....	Unofficial.
Oct. 24th..	Catlett's Station, Virginia	Detachment of 3d West Virginia Cavalry	.....	.....	.....	.....	.....	2	Rebellion Record, Vol. VI, page 7.
Oct. 24th..	Grand Prairie, Missouri	Two battalions Missouri Militia Cavalry	.....	3	.....	8	20	.....	Unofficial.
Oct. 24th..	Blackwater, Virginia	1st New York Mounted Rifles, 39th Illinois and 62d Ohio Volunteers, and other troops commanded by Brigadier General Terry.	1	.....	.....	3	.....	.....	Ohio in the War, Vol. 2, page 369.
Oct. 24th..	Morgantown, Kentucky	.....	.....	.....	.....	.....	.....	16	Newspaper report.
Oct. 27th..	Pittman's Ferry, Missouri	23d Iowa and 24th and 27th Missouri Volunteers, 1st Missouri Militia, and 12th Missouri Cavalry.	.....	.....	.....	.....	.....	40	Report of Adjutant General of Iowa, 1863, p. 825. Official Report of Colonel Wm. Dewey.
Oct. 27th..	Labadiesville, Louisiana	8th New Hampshire, 12th and 13th Connecticut, and 75th New York Volunteers. 1st Louisiana Cavalry, and 1st Maine Battery, commanded by Brig. General G. Weitzel.	18	68	.....	6	15	208	Official Report of Major General B. F. Butler, U. S. V. Also known as Thibodeauxville and Georgia Landing.
Oct. 28th..	Cross Hollows, Fayetteville, Arkansas..	One division of the Army of the Frontier, commanded by Brigadier General Herron.	.....	5	.....	8	7	.....	Official. Also known as Oxford Bend.
Oct. 28th..	Clarkson, Missouri	Detachments, commanded by Captain Rodger's, 2d Illinois Artillery.	.....	.....	.....	10	2	45	Report of Adjutant General of Illinois, Vol. III, page 202.
Oct. 28th..	Williamsburg, Kentucky	7th Kentucky Volunteers	.....	.....	.....	.....	.....	.....	
Oct. 29th..	Butler and Osage, Missouri	1st Kansas Colored Troops (79th U. S. C. T.)	9	9	.....	.....	30†	.....	Casualty List, File A, No. 570, S. G. O. Official. Also known as Island Mounds.
Oct. 31st..	Aldie, Virginia	1st New Jersey and 2d New York Cavalry, of General Bayard's Cavalry Brigade, Army of the Potomac.	.....	.....	.....	.....	.....	.....	New Jersey in the Rebellion, page 433.
Oct. 31st..	Franklin, Virginia	.....	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. VI, page 9.
Nov. 1st...	Philomont, Virginia	Cavalry of the Army of the Potomac, commanded by General Pleasonton.	1	14	.....	5	10	.....	Official Report of Major General McClellan.
Nov. 2d and 3d.	Bloomfield and Union, Loudoun County, Virginia.	Cavalry advance of the Army of the Potomac, commanded by General Pleasonton.	2	10	.....	3	15	.....	Official Report of Major General McClellan.
Nov. 2d...	Snicker's Gap, Virginia	Batteries of the Second Corps, Army of the Potomac...		16	.....	.....	.....	.....	

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1862.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Nov. 3d...	Upperville, Virginia	Cavalry advance of the Army of the Potomac, commanded by General Pleasonton.	.....	5	.....	3	10	.....	Official.
Nov. 3d...	Rawles' Mills, Williamston, North Carolina.	24th and 44th Massachusetts and 9th New Jersey Volunteers, and New York and Marine Batteries.	6	8	.....	.....	.....	5	Official Report of Major General J. G. Foster, commanding. Also called Little Creek.
Nov. 3d...	Bayou Teche (14 miles from Brashear City), Louisiana.	Union gunboats Kinsman, Estelle, St. Mary, Calhoun, and Diana, and 21st Indiana Volunteers.	6	7	.....	.....	.....	.....	Report of Adjutant General of Indiana, Vol. II, page 208.
Nov. 3d...	Harrisonville, Cass County, Missouri	5th and 6th Missouri Cavalry	10	3	6	6	20	.....	Official.
Nov. 5th...	Lamar, Missouri	8th Missouri and 8th Missouri Militia Cavalry	2	2	.....	.....	.....	.....	Official.
Nov. 5th...	Manassas Gap, Virginia	Cavalry Brigade, advance of the Army of the Potomac, commanded by General Averill.	.....	.....	.....	.....	.....	.....	Official Report of Major General McClellan.
Nov. 5th...	Barbee's Cross Roads and Chester Gap, Virginia.	Cavalry Brigade, Army of the Potomac, commanded by General Pleasonton.	5	10	.....	36	.....	.....	Official. Also called Markham.
Nov. 5th...	Greenville Road, Kentucky	8th Kentucky Cavalry	.....	.....	.....	8	.....	.....	
Nov. 5th...	New Baltimore, Salem, and Thoroughfare Gap, Virginia.	Cavalry Brigade, advance of the Army of the Potomac, commanded by General Bayard.	.....	.....	.....	.....	.....	.....	Official.
Nov. 5th...	Nashville, Tennessee	16th and 51st Illinois, 69th Ohio, 14th Michigan, and 78th Pennsylvania Volunteers, and 5th Tennessee and 7th Pennsylvania Cavalry.	.....	26	19	.....	.....	23	Official Report of Brigadier General James S. Negley, commanding.
Nov. 6th...	Leatherwood, Kentucky	Captain Ambrose Powell's command	.....	.....	.....	7	.....	.....	Rebellion Record, Vol. VI, page 12.
Nov. 6th...	Garrettsburg, Kentucky	8th Kentucky Cavalry	.....	.....	.....	17	85	60	
Nov. 7th...	Rhea's Mills, Arkansas	3d Kansas Indian Home Guards	3	3	.....	.....	.....	.....	Official.
Nov. 7th...	Big Beaver Creek, Missouri	10th Illinois and two companies Missouri Militia Cavalry	.....	.....	300	.....	.....	.....	Rebellion Record, Vol. VI, page 12.
Nov. 7th...	Marianna, Arkansas	3d and 4th Iowa and 9th Illinois Cavalry	3	20	.....	.....	.....	56*	Report of Adjutant General of Illinois, Vol. III, page 96. Also called La Grange.
Nov. 8th...	Rappahannock Bridge, Virginia	Cavalry Brigade, Army of the Potomac, commanded by General Bayard.	.....	8	.....	.....	.....	.....	
Nov. 8th...	Hudsonville, Mississippi	7th Kansas and 2d Iowa Cavalry	.....	.....	.....	16	.....	185	Rebellion Record, Vol. VI, Doc. 39, page 189. Also known as Cold Water.
Nov. 9th...	Fredericksburg, Virginia	1st Indiana Cavalry	1	.....	4	3	.....	39	Official Report of Captain Ulric Dahlgren.
Nov. 9th...	Moorefield, Virginia	1st New York, Ringgold, and Washington Cavalry, and 23d Illinois Volunteers.	.....	5	.....	.....	.....	50	Official Report of Brigadier General B. F. Kelley. Also called South Fork, Potomac.
Nov. 9th...	Perry County, near Kentucky River, Kentucky.	14th Kentucky Cavalry	.....	.....	.....	3	.....	.....	Rebellion Record, Vol. VI, page 14.
Nov. 11th..	Huntsville, Tennessee	Tennessee Home Guards	.....	.....	.....	4	.....	.....	Rebellion Record, Vol. VI, page 14.
Nov. 11th..	New Berne, North Carolina		.....	.....	.....	.....	.....	.....	Newspaper report. Also known as Bachelor's Creek.
Nov. 11th..	Lebanon, Tennessee	1st Kentucky and 4th Michigan Cavalry	.....	.....	.....		.....	125	Report of Adjutant General of Kentucky. Also designated La Grange.

Nov. 12th..	Lamar and Holly Springs, Mississippi...	2d Illinois, 3d Michigan, 2d Iowa, and 7th Kansas Cav..	.....	.....	.....	4	.....	.....	Official.
Nov. 15th..	Fayetteville and White Sulphur Springs, Virginia.	1st and 2d Brigades, Sturgis's Division, Ninth Corps, and Cavalry, Army of the Potomac.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Maine. Also known as Little Washington.
Nov. 17th..	Gloucester, Virginia	104th Pennsylvania Volunteers	1	3	2	.....	.....	.....	Rebellion Record, Vol. VI, page 16.
Nov. 18th..	Cove Creek, North Carolina	2d New York Cavalry.	.....	.....	.....	.....	.....	.....	Newspaper report.
Nov. 18th..	Rural Hills, Tennessee.....	8th Kentucky Cavalry.....	.....	.....	.....	16	.....	.....	Newspaper statement.
Nov. 21st..	Bayou Bontecou, near Fort Pike, La.....	31st Massachusetts Volunteers	.....	1	.....	4	.....	.....	Newspaper statement.
Nov. 24th..	Beaver Creek, Texas County, Missouri..	3d Missouri Cavalry and 21st Iowa Volunteers	6	10	22	5	20	.....	Official.
Nov. 25th..	Camp Babcock, Arkansas	3d Kansas Indian Home Guards	1	1	.....	.....	.....	.....	Official.
Nov. 25th..	Crawford County, Missouri.....	Missouri Enrolled Militia.....	.....	.....	.....	.....	.....	.....	Official.
Nov. 26th..	Cold Knob Mountain, Virginia.....	2d West Virginia Cavalry, commanded by Colonel J. C. Paxton.	.....	.....	.....	2	2	111	Official. Also known as Sinking Creek and Frankfort.
Nov. 26th..	Summerville, Mississippi	7th Illinois Cavalry	.....	.....	.....	.....	.....	28	Rebellion Record, Vol. VI, page 19.
Nov. 27th..	Carthage, Arkansas.....	2d Kansas Cavalry.....	1	.....	1	.....	.....	.....	Official.
Nov. 27th..	Scrougesville and La Vergne, Tennessee.	5th Brigade, Sill's Division, Army of the Ohio	.....	10	.....	.....	.....	.....	Newspaper report.
Nov. 28th..	Cane Hill, Boston Mountains, and Boonsboro', Arkansas.	1st Division, Army of the Frontier, commanded by Brigadier General James G. Blunt.	4	36	.....	75	300	60	Official Report of Major General H. W. Halleck.
Nov. 28th..	Little Bear Creek, Alabama.....	Portion of the 2d Division, Sixteenth Corps.....	4	14	.....	.....	.....	70	Report of Adjutant General of Iowa, 1865, p. 157.
Nov. 28th..	Hartwood Church, Virginia.....	3d Pennsylvania Cavalry.....	4	9	200	.....	.....	.....	Official.
Nov. 29th..	Cold Water River, Mississippi	1st Indiana Cavalry.....	.....	.....	.....	3	5	.....	Official Report of General C. C. Washburne.
Nov. 29th and 30th.	Waterford and Lumkin's Mills, Miss.....	Advance Cavalry of General Grant's Army.....	.....	.....	.....	.....	.....	.....	
Nov. 30th..	Stahel's reconnoissance to Snicker's Ferry, and Berryville, Virginia.	1st Cavalry Brigade, Stahel's Division.....	.....	.....	.....	.....	.....	.....	Official Report of Major General F. Sigel.
Dec. 1st...	Charleston and Berryville, Virginia	2d Division, Twelfth Corps	.....	.....	.....	5	18	.....	Official Report of Brigadier General J. W. Geary.
Dec. 2d...	Franklin, Virginia	11th Pennsylvania Cavalry.....	.....	.....	.....	.....	.....	20	Newspaper report.
Dec. 2d...	King George Court-House, Virginia	8th Pennsylvania Cavalry.....	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol VI, page 21.
Dec. 2d...	Ozark, Missouri.....	3d and 9th Missouri Cavalry.....	.....	.....	.....	4	.....	2	Official.
Dec. 3d...	Oakland, Mississippi	1st Indiana Cavalry.....	.....	10	.....	.....	12	.....	Official Report of Brigadier General C. C. Washburne.
Dec. 3d...	Oxford, Mississippi.....	2d Cavalry Brigade, commanded by Colonel Hatch	.....	.....	.....	.....	20†	92	
Dec. 4th...	Wireman's Shoals, Big Sandy River, Kentucky.	39th Kentucky Volunteers.....	3	.....	16	.....	.....	.....	Report of Adjutant General of Kentucky, p. 485.
Dec. 4th...	Water Valley, Mississippi	1st and 2d Cavalry Brigades, commanded by Colonels Hatch and Lee.	.....	.....	.....	.....	.....	300	
Dec. 5th...	Coffeeville, Mississippi	1st, 2d, and 3d Cavalry Brigades, of General Grant's Army, commanded by Colonels Lee, Hatch, and Mizener.	10	54	35	7	43	10	Official reports, Union and Confederate.
Dec. 5th...	Helena, Arkansas.....	30th Iowa and 29th Wisconsin Volunteers	.....	.....	.....	8	.....	30	Rebellion Record, Vol. VI, page 22.
Dec. 5th...	Reed's Mountains, Arkansas.....	2d Kansas Cavalry.....	2	5	.....	.....	.....	.....	Official.
Dec. 6th...	Lebanon, Tennessee	93d Ohio Volunteers.....	1	3	.....	.....	.....	.....	Official.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1862.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Dec. 7th...	Prairie Grove, Arkansas	1st, 2d, and 3d Divisions of the Army of the Frontier, commanded by Brigadier Generals J. G. Blunt and F. J. Herron.	167	798	183	300	.....	1,200 §	Appendix to Part I, Medical and Surgical History of the War, page 312. Official Report of Major General S. R. Curtis. Also known as Fayetteville and Illinois Creek.
Dec. 7th...	Hartsville, Tennessee	106th and 108th Ohio and 104th Illinois Volunteers, 2d Indiana and 11th Kentucky Cavalry, and 13th Indiana Battery.	55	.....	1,800	21	114	14	Official Report of Brigadier General John Morgan, C. S. A.
Dec. 9th...	Dobbin's Ferry, Tennessee	35th Indiana, 51st Ohio, and 8th and 21st Kentucky Volunteers, and 7th Indiana Battery.	5	48	6	.....	.....	.....	Ohio in the War, page 310. Casualty List, S. G. O. Also known as La Vergne.
Dec. 9th...	Brentville, Tennessee	25th Illinois, 8th Kansas, and 81st Indiana Volunteers and 8th Wisconsin Battery.	.....	1	.....	.....	.....	.....	Official Report of Colonel John A. Martin.
Dec. 12th..	Little Bear Creek, Alabama	Troops commanded by Colonel Sweeney, 52d Illinois Volunteers.	1	.....	2	11	30	40	Report of Adjutant General of Illinois, Vol. II, p. 59.
Dec. 12th..	Zuni, near Blackwater, Virginia	Brigade, commanded by General Ferry	3	11	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 369. Casualty List, S. G. O.
Dec. 12th..	Trenton, North Carolina	3d New York Cavalry, advance of Major General Foster's troops.	.....	.....	.....	3	.....	18	Official.
Dec. 12th..	Franklin, Tennessee	Stanley's Cavalry Division, Army of the Cumberland..	1	.....	.....	5	10	12	
Dec. 12th to 18th.	Foster's expedition to Goldsboro', North Carolina.	Wessell's Brigade of Peek's Division, 1st, 2d, and 3d Brigades, 1st Divison, Department of North Carolina.	90	478	9	71	268	400	Official Reports of Major Generals J. G. Foster, commanding Union, and G. W. Smith, commanding Confederate forces.
Dec. 13th..	Fredericksburg, Virginia	Second Corps, Major General Couch, and Ninth Corps, Major General Wilcox—Right Grand Division, Major General Sumner; First Corps, Major General Reynolds, and Sixth Corps, Major General W. F. Smith—Left Grand Division, Major General Franklin Fifth Corps, Major General Butterfield, and Third Corps, Major General Stoneman—Centre Grand Division, Major General Hooker; Army of the Potomac, Major General A. E. Burnside.	1,180	9,028	2,145	579	3,870	127	Casualty List, S.G O. Appendix to Part I, Medical and Surgical History of the War, page 92. Official Reports of Major General A. E. Burnside, U. S. V., and Lieut. General R. E. Lee, C. S. A. In the Union Army, Brigadier Generals C. F. Jackson and G. D. Bayard were killed, and Gibbons and Vinton wounded; in the Confederate Army, Brigadier General T. R. R. Cobb was killed and Maxcy Gregg wounded.
Dec. 13th..	South-West Creek, North Carolina	9th New Jersey and 85th Pennsylvania Volunteers, 3d New York Cavalry, and 3d New York Artillery.	3	8	.....	.....	.....	.....	New Jersey and the Rebellion, page 220.
Dec. 14th..	Kingston, North Carolina	Wessell's Brigade of Peek's Division and the 1st, 2d, and 3d Brigades, 1st Division, Department of North Carolina.	40	120	.....	50	75	400	Casualty List, File A, No. 581, S. G. O. Official Report of Major Gen. J. G. Foster, commanding.
Dec. 14th..	Fort Brown Road, Texas	.....	.....	.....	.....	.....	.....	.....	Newspaper report.
Dec. 16th..	Whitehall, North Carolina	9th New Jersey, 17th, 23d, 24th, and 45th Massachusetts Volunteers, 3d New York Cavalry, and 3d and 23d New York Batteries.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O. Official Report of Major General J. G. Foster, commanding.
Dec. 17th..	Goldsboro', North Carolina	9th New Jersey, 3d, 17th, 25th, 27th, and 43d Massasetts Volunteers, 3d New York Cavalry, and 3d and 23d New York Artillery.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O. Official Report of Major General J. G. Foster, U. S. A.
Dec. 18th..	Lexington, Tennessee	11th Illinois, 5th Ohio, and 2d Tennessee Cavalry	7	10	124	7	28	.....	Official.
Dec. 18th..	Jackson, Tennessee	11th Illinois and 5th Ohio Cavalry, and 43d and 61st Illinois Volunteers.	1	5	.....	.....	70	3	Report of Adjutant General of Illinois, Vol. I, page 664. Also called Salem Cemetery.

Dec. 19th..	Occoquan, Dumfries, Virginia	Wagon train guard of the Twelfth Army Corps							Casualty List, S. G. O.
Dec. 20th..	Holly Springs, Mississippi	2d Illinois Cavalry			1,000				Surrendered by Colonel Murphy, 8th Wisconsin Vols., to the Confederates under Van Dorn.
Dec. 20th..	Trenton, Tennessee	Detachments 7th Tennessee Cavalry, 122d Illinois Volunteers, and convalescents.	1		250	17	50		Official Report of Colonel Jacob Fry, 61st Illinois Volunteers. Post captured by Forrest.
Dec. 21st..	Davis' Mills, Wolf River, Mississippi	Six companies 25th Indiana Volunteers and two companies 5th Ohio Cavalry.		3		22	50	20	Official Report of Colonel Wm. H. Morgan, 25th Indiana, commanding post.
Dec. 22d..	Isle of Wight Court-House, Virginia	Detachment of 2d New York Mounted Rifles					2		Unofficial.
Dec. 24th..	Middleburg, Mississippi Central R. R.	One hundred and fifteen men of the 12th Michigan Volunteers.		9	13	9	11	15	Report of Adjutant General of Michigan, 1862, p. 83.
Dec. 24th..	Glasgow, Kentucky	Five companies of the 2d Michigan Cavalry	1	1	16	3	3	7	Official Report of Colonel E. H. Hobson.
Dec. 25th..	Green's Chapel, Kentucky	Detachment of the 4th and 5th Indiana Cavalry	1		2	9	22	5	Official Report of Colonel E. H. Hobson.
Dec. 25th..	Bear Wallow, Kentucky	Two battalions of the 12th Kentucky Cavalry				1	3	12	Official Report of Colonel E. H. Hobson.
Dec. 26th..	Bacon Creek, Kentucky	Detachment of the 2d Michigan Cavalry		23					Official Report of Colonel E. H. Hobson.
Dec. 26th..	Nolansville, Tennessee	2d brigade, 1st division, McCook's Corps, advance of the right wing of the Army of the Cumberland.							Also known as Knob Gap.
Dec. 27th..	Elizabethtown, Kentucky	91st Illinois Volunteers			500				Report of Adjutant General of Illinois, Vol. II, page 345. Post captured by General Morgan.
Dec. 27th..	Dumfries, Virginia	5th, 7th, and 66th Ohio Volunteers, 6th Maine Battery, 12th Illinois and 1st Maryland Cavalry.	3	8	5	25	40		Ohio in the War, Vol. II, page 45.
Dec. 28th..	Muldraugh's Hill, Kentucky	6th Indiana Cavalry			400				Report of Adjutant General of Indiana. Vol. II, page 663.
Dec. 28th..	Suffolk, Virginia	Reconnoitering force, commanded by Acting Brigadier General Gibbs.							Rebellion Record, Vol, VI. page 29.
Dec. 28th..	Dripping Springs, near Van Buren, Ark.	Army of the Frontier	2	6		7		120	Official Report of Brigadier General J. G. Blunt.
Dec. 28th..	Elk Fork, Campbell County, Tennessee	6th and 10th Kentucky Cavalry				30	176	51	Official dispatches.
Dec. 28th..	Occoquan, Virginia	2d and 17th Pennsylvania Cavalry		20	100				Unofficial.
Dec. 28th..	Clinton, Louisiana								Confederate sources.
Dec. 28th and 29th.	Chickasaw Bayou, Vicksburg, Mississippi.	Brigadier Generals G. W. Morgan's, Frederick Steele's, Morgan L. Smith's, and A. J. Smith's divisions, right wing, Army of Tennessee, commanded by Major General W. T. Sherman.	191	982	756		207		Casualty List. File A. No. 273. Official reports. Major General M. L. Smith, wounded.
Dec. 29th..	Stewart Creek, Tennessee	3d Kentucky, in advance of Crittenden's Corps, left wing of the Army of the Cumberland.							Report of Adjutant General of Kentucky, Vol. I, page 629.
Dec. 30th..	Wautauga Bridge and Carter's Station, Tennessee.	7th Ohio and 9th Pennsylvania Cavalry	1	2		7	15	273	Ohio in the War, Vol. II, page 797. Carter's raid into East Tennessee.
Dec. 30th..	Parker's Cross Roads, Tennessee	18th, 106th, 119th, and 122d Illinois, 27th, 39th, and 63d Ohio, 50th Indiana, 39th Iowa, and 7th Tennessee Volunteers, 7th Wisconsin Battery, commanded by Colonel C. L. Dunham, and Brigadier General J. C. Sullivan.	23	139	58	50	150	300	Casualty List, S. G. O. Official reports. Also known as Red Mound.
Dec. 30th..	Jefferson, Tennessee	2d brigade, 1st division, Thomas's Corps, guarding wagon train.	20	40		15	50		Official Report of Major General G. H. Thomas.

§ Wounded and missing.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Dec. 31st, 1862, to Jan. 2d,'63.	Stone's River, Tennessee	McCook's Corps, right wing; Thomas's Corps, centre; and Crittenden's Corps, left wing, Army of the Cumberland, commanded by Major General W. S. Rosecrans.	1,533	7,245	2,800	.....	..... 9,000†	14,560* 2,000	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 255. Among the casualties in the Union Army were Brigadier General Sill, killed, and Kirk, wounded; in the Confederate Army, Brigadier Generals Raines and Hanson, killed, and Chalmers and Davis, wounded. Also known as Murfreesboro'.
1863. Jan. 1st..	Galveston, Texas	U. S. gunboats Westfield, Harriet Lane, Owasco, Sachem, Clifton, and Coryphæus, and three companies of the 42d Massachusetts Volunteers.	.....	.....	600*	.....	50†	.....	Official Report of Committee of Inquiry, January 12, 1863. Commanders Wainright and Renshaw were killed. Report of Adjutant General of Massachusetts, 1862, page 438.
Jan. 1st...	Stewart's Creek, Tennessee	3d Ohio Cavalry and 10th Ohio Volunteers, guarding wagon train.	.....	.....	.....	.....	.....	.....	Official Reports.
Jan. 1st...	La Vergne, Tennessee	1st Michigan Engineers and Mechanics	1	6	.....	.....	.....	.....	Report of Adjutant General of Michigan, 1863, p. 21.
Jan. 3d....	La Grange, Arkansas	Portion of General Washburn's Cavalry division	.....	.....	.....	.....	10†	12	Official.
Jan. 3d....	Moorefield, West Virginia	116th Ohio Volunteers	.....	.....	65	.....	.....	.....	Ohio in the War, Vol. 2, page 606.
Jan. 5th...	Middletown, Tennessee	Cavalry of the Army of the Cumberland	.....	.....	.....	.....	.....	.....	Official reports.
Jan. 5th...	Hardy County, West Virginia		1	.....	33	.....	.....	.....	Rebellion Record, Vol. VI, page 32.
Jan. 7th and 8th.	Springfield, Missouri	Missouri Militia, convalescents, and citizens	14	144	5	40	.....	200	Official Report of Major General H. W. Halleck. Brigadier General E. B. Brown, commanding Union troops, was wounded.
Jan. 8th...	Ripley, Tennessee	2d Illinois Cavalry	.....	3	.....	8	20	46	Rebellion Record, Vol. VI, page 33.
Jan. 10th..	Catlett's Station, Virginia		.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. VI, page 33.
Jan. 11th..	Hatteras and Alabama, off the coast of Texas.	United States steamer Hatteras, eight guns	2	3	110	.....	1	.....	Official Report of Lieutenant R. G. Blake, U. S. N.
Jan. 11th..	Fort Hindman, Arkansas Post, Arkansas	Thirteenth Corps, Major General J. A. McClernand, and Fifteenth Corps, Major General W. T. Sherman, Army of Mississippi, and gunboats of the Mississippi squadron.	129	831	17	100	400	5,000	Casualty List, S. G. O. Official Reports of Major General H. W. Halleck and Rear-Admiral D. D. Porter.
Jan. 11th..	Hartsville, Missouri	21st Iowa and 99th Illinois Volunteers, 3d Iowa and 3d Missouri Cavalry, and Battery L, 2d Missouri Artillery.	7	64	7	.....	300†	29	Official Report of Brigadier General Fitz-Henry Warren. Also known as Woods Fork. Brigadier General McDonald, C. S. A., killed.
Jan. 12th..	Lick Creek, Arkansas	2d Wisconsin Cavalry	1	1	9	.....	.....	.....	Official.
Jan. 14th..	Bayou Teche, Louisiana	8th Vermont, 16th and 75th New York, 12th Connecticut, 6th Michigan, and 21st Indiana Volunteers, 1st Louisiana Cavalry, 4th and 6th Massachusetts, and 1st Maine Battery, and gunboats Calhoun, Diana, Kinsman, and Estrella.	10	27	.....	15	.....	.....	Official. Army commanded by Brigadier General Weitzel; Navy by Commodore Buchanan; rebel gunboat Cotton destroyed; Commodore Buchanan, U. S. N., was killed.
Jan. 15th..	Helena and Clarendon Road, Arkansas	2d Wisconsin Cavalry	.....	.....	17	1	6	.....	
Jan. 16th..	Duval's Bluff and Des Ares, Arkansas	U. S. gunboat DeKalb and 24th Indiana Volunteers	.....	.....	.....	.....	.....	7	Official.
Jan. 17th..	Pollocksville and Northeast River, North Carolina.	3d New York Cavalry	.....	.....	.....	.....	.....	.....	Colonel S. H. Mix's raid in North Carolina, January 16th to 22d.

Jan. 19th	Burnt Ordinary, Virginia	5th Pennsylvania Cavalry			1			4	Rebellion Record, Vol. VI, page 36.
Jan. 23d	Fish Springs, Tennessee		4						Confederate sources.
Jan. 24th	Woodbury, Tennessee	2d division, Crittenden's Corps	2	1		35		100	Official reports.
Jan. 25th	Construction train, near Murfreesboro', Tennessee.	Train guard, reinforced by part of the 10th Michigan Volunteers.							Report of Adjutant General of Michigan, 1863, page 78.
Jan. 26th	Township, Florida	33d U. S. colored troops	1	6					Official.
Jan. 26th	Bear River, Washington Territory	Four companies of the 2d California Cavalry and one company of the 3d California Volunteers.	14	49		224			Casualty Lists, S. G. O. Indian fight. 142 men of the command had their feet frozen.
Jan. 27th	Indian Village, Plaquemine Bayou, La.	1st Louisiana Cavalry, commanded by Capt. Williamson							Tribune Almanac.
Jan. 29th	Pinos Altos, Arizona Territory	One company of the 1st California Volunteers							Official.
Jan. 30th	Dyersburg, Tennessee	22d Ohio Volunteers					34		Ohio in the War, Vol. 2, page 157.
Jan. 30th	Deserted House, near Suffolk, Virginia	Portion of Major General Peck's forces, commanded by Brigadier General Michael Corcoran and Colonel S. P. Spear.	24	80			50		Casualty List, File A, No. 544, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 81. Also designated Carsville and Kelly's Store.
Jan. 31st	Rover, Tennessee	4th Ohio Cavalry				12	12	300	Unofficial.
Jan. 31st	Middleton, Tennessee	2d and 3d Tennessee Cavalry						42	Report of Adjutant General of Tennessee, 1866, page 386.
Jan. 31st	Off Charleston Bar, South Carolina	U. S. steamers Mercedita, Keystone State, Augusta, Quaker City, Housatonic, and Memphis.	4	23					Official Report of Rear Admiral S. F. Dupont, U. S. N., and Flag Officer D. N. Ingraham, C. S. N.
Feb. 1st	Fort McAlister, Genesis Point, Georgia	U. S. Navy							Unofficial.
Feb. 1st	Franklin, Tennessee		1					3	
Feb. 3d	Mingo Swamp, Missouri	12th Missouri Militia, commanded by Major F. W. Reeder.				8	20		Newspaper reports.
Feb. 3d	Fort Donelson, Tennessee	83d Illinois Volunteers, 2d Illinois Artillery, and a battalion of the 5th Iowa Cavalry.	16	60	50	140	400	130	Casualty List, S. G. O. Official Reports. Also known as Cumberland Iron Works.
Feb. 4th	Batesville, Arkansas	Brigade of Cavalry, commanded by Colonel George E. Waring, jr.							General Davidson's official dispatches.
Feb. 5th	Bear Creek, Johnson County, Missouri	40th Missouri Enrolled Militia, commanded by Capt. W. K. Ranney.				7			Official Report of Lieutenant Colonel Brown.
Feb. 7th	Williamsburg, Virginia	5th Pensylvania Cavalry, commanded by Lieutenant Colonel William Lewis.	1	1	35				
Feb. 3d and 8th.	Independence, Missouri	5th Missouri Militia Cavalry, commanded by Lieutenant Colonel D. A. Colvin.				8	2		Official Report of Colonel Penicks.
Feb. 8th	Lebanon, Tennessee							660	Rebellion Record, Vol. VI, page 44.
Feb. 9th	Summerville, Virginia	Cavalry commanded by Major Knox							
Feb. 10th	Old River, Lake Providence, Louisiana	Detailed men from the 1st Kansas, 17th and 95th Illinois, and 16th Wisconsin Volunteers, and 3d Louisiana Cavalry, commanded by Captain T. Tucker.	1	7		4	7	26	Official Report.
Feb. 10th	Gloucester Point, Virginia								Lossing's Civil War in America, Vol. III, page 21.
Feb. 10th	Wachita Indiana Agency, Texas	Loyal Delawares and Shawnees		4				100	Official.
Feb. 10th	Bone Yard, Tennessee	18th Missouri Volunteers							Official.
Feb. 13th	Smithfield, Virginia	12th Pennsylvania Cavalry	1	2	4	1		3	Official dispatches of General B. F. Kelley.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Feb. 13th..	Bolivar, Tennessee	Cavalry				4	5		Newspaper report.
Feb. 14th..	Brentsville, Virginia	1st Michigan Cavalry		15					Report of Adjutant General of Michigan, 1863.
Feb. 14th..	Gordon's Landing, Red River, Louisiana	U. S. ram Queen of the West	1	1	18				Official Report of Colonel Charles L. Ellet.
Feb. 15th..	Cainsville, Tennessee	123d Illinois Volunteers and one company of the 5th Tennessee Cavalry.		3		8	20	6	Newspaper statement.
Feb. 15th..	Nolensville, Tennessee	Detachment from the 2d Minnesota Volunteers, guarding a wagon train.				8	20	4	Newspaper reports.
Feb. 15th..	Arkadelphia, Arkansas	Captain Brown's command	2	12		14	12		Unofficial.
Feb. 16th..	Romney, near, Virginia	Detachments of the 116th and 122d Ohio Volunteers, guarding a wagon train.			72				Official Report of Lieutenant General R. E. Lee. C. S. A.
Feb 18th..	Milton, Tennessee	2d Michigan and 3d Ohio Cavalry							Report of Adjutant General of Michigan, 1863, p. 26.
Feb. 19th..	Spring River, Missouri	One company of the 9th Kansas							Official.
Feb. 19th..	Cold Water, Mississippi	Cavalry, commanded by Lieutenant Colonel W. F. Wood, 1st Indiana Cavalry.				6	3	15	
Feb. 20th..	Yazoo Pass, Mississippi	5th Illinois Cavalry		5		16		26	
Feb. 21st..	Prairie Station, Mississippi	2d Iowa Cavalry	1	3	1				Official.
Feb. 22d..	Tuscumbia, Alabama	Cavalry brigade, commanded by Colonel F. M. Cornyn, 10th Missouri Cavalry.						6	Report of Adjutant General of Missouri, 1865, page 366.
Feb. 23d..	Deer Creek, near Greenville, Mississippi	General Burbridge's division of the Thirteenth Corps							
Feb. 23d..	Athens, Kentucky								
Feb. 24th..	Mississippi River, below Vicksburg	U. S. steamer Indianola, commanded by Lieutenant Commander George Brown.	1	1	7	35			Official Report of David D. Porter.
Feb. 25th..	Hartwood Church, Virginia	Brigadier General Averill's Cavalry brigade			150		14		Official.
Feb. 26th..	Strasburg Road, Virginia	13th Pennsylvania and 1st New York Cavalry			200	2	2		Official.
Feb. 27th..	New Berne, near, North Carolina	Detachment of 3d New York Cavalry, commanded by Captain Jacobs.		1	2	3		48	
Mar. 1st...	Bradyville, Tennessee	1st Tennessee and 3d and 4th Ohio Cavalry, commanded by General Stanley.	1	6		5	25	100	Newspaper reports.
Mar. 2d...	Eagleville, Tennessee	Foraging detachment of 15th, 16th, 18th, and 19th U. S. Infantry, commanded by Colonel Sheppard.							Unofficial.
Mar. 2d and 4th.	Petersburg, Chapel Hill, and Harpeth River, Tennessee.	1st Tennessee Cavalry, commanded by Lieutenant Colonel J. P. Brownlow.				12	20	72	
Mar. 3d...	Fort McAllister, Genesis Point, Georgia	U. S. Navy							Newspaper reports.
Mar. 3d...	Owen's Valley	2d California Cavalry		4					Official.
Mar. 4th..	Skeet, North Carolina	3d New York Cavalry, commanded by Captain Colin Richardson.	3	15			28		Newspaper report. Also known as Swan's Quarter.

Mar. 4th and 5th.	Thompson's Station, Tennessee	33d and 85th Indiana, 22d Wisconsin, 19th Michigan, and 124th Ohio Volunteers, 18th Ohio Battery, and 2d Michigan, 9th Pennsylvania, and 4th Kentucky Cavalry, commanded by Colonel John Coburn, 33d Indiana.	100	300	1,306	150	450		Casualty List, S. G. O., and official reports. Also known as Spring Hill and Unionville.
Mar. 8th	Fairfax Court-House, Virginia				33				Official. Mosby's midnight raid. Brigadier General Stoughton captured in his tent.
Mar. 9th	Bolivar, Tennessee							18	
Mar. 9th	Franklin, Tennessee	125th Ohio Volunteers, commanded by Colonel E. Opdyke.							Ohio in the War, Vol. 2, page 642.
Mar. 10th	Covington, Tennessee	6th and 7th Illinois Cavalry, commanded by Colonel B. H. Grierson, 6th Illinois Cavalry.				25			Report of Adjutant General of Illinois, Vol. III, page 65.
Mar. 10th	Rutherford's Creek, Tennessee	4th Cavalry Brigade, commanded by Colonel Minty							Report of Adjutant General of Indiana, Vol. II, page 19.
Mar. 11th	Paris, Kentucky	Wagon-train guard							Unofficial.
Mar. 13th to Apr. 5th.	Fort Pemberton, Greenwood, Mississippi	U. S. gunboats Chillicothe and De Kalb, and troops of the Thirteenth and Seventeenth Corps, commanded by Brigadier Generals L. F. Ross and J. F. Quimby.							Official.
Mar. 13th	Berwick City, Louisiana	160th New York Volunteers							
Mar. 14th	Port Hudson, Mississippi River, La	Union fleet, commanded by Admiral D. G. Farragut, and Union troops commanded by Major General N. P. Banks.		65					Official Report of Major General N. P. Banks.
Mar. 14th	New Berne, North Carolina	Troops of the Department of Virginia and North Carolina, commanded by Major General Foster; and gunboats.	2	4					Official Report of Major General Halleck.
Mar. 16th to 22d.	Expedition up Steele's Bayou, Miss	2d Division, Fifteenth Corps, commanded by General Sherman, and navy commanded by Admiral Porter.						400*	
Mar. 17th	Blackwater, Virginia	11th Pennsylvania Cavalry, commanded by Colonel S. P. Spear.	1	16					
Mar. 17th	Kelly's Ford, Virginia	1st and 5th U. S., 3d, 4th, and 16th Pennsylvania, 1st Rhode Island, 6th Ohio, and 4th New York Cavalry, and 6th New York Battery, commanded by Brigadier General W. W. Averill.	9	35	40	11	88	37	Official Report of Brigadier General Fitz-Hugh Lee, C. S. A.
Mar. 18th	Brashear City, Louisiana	1st Louisiana Cavalry				10	20		
Mar. 20th	Vaught's Hill, near Milton, Tennessee	105th Ohio, 101st Indiana, 80th and 123d Illinois Volunteers, 1st Tennessee Cavalry, and 9th Indiana Battery.	7	48	7	63	300	10	Casualty List, S. G. O. Official Report of Major General H. W. Halleck.
Mar. 21st	Salem Pike, near Murfreesboro', Tenn	3d Tennessee Cavalry				4			Report of Adjutant General of Tennessee, 1866, page 387.
Mar. 21st	Cottage Grove, Tennessee								Unofficial.
Mar. 21st	Deer Creek, Mississippi	2d Division, Fifteenth Corps, commanded by Major General Sherman, and Mississippi fleet, commanded by Admiral Porter.							Engagement during the expedition up Steele's Bayou.
Mar. 22d	Blue Springs, Missouri	1st and 5th Missouri Militia Cavalry	9		5				Official. Skirmish with Quantrell's guerillas.
Mar. 22d	Mount Sterling, Kentucky	10th Kentucky Cavalry	4	10		8	13		Official.
Mar. 24th	Danville, Kentucky	1st Kentucky and 2d Tennessee Cavalry, 18th and 22d Michigan Volunteers, and 1st Indiana Battery.							Report of Adjutant General of Michigan.

* Killed, wounded, and missing.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Mar. 24th..	Ponchatoula, Louisiana	127th and 165th New York, 9th Connecticut, 14th and 24th Maine, and 6th Michigan Volunteers.	.....	6	.....	3	11	12	Official Report of Colonel Thomas S. Clark, 6th Michigan Volunteers, commanding.
Mar. 25th.	Brentwood, Tennessee	Detachment of 22d Wisconsin and 19th Michigan Volunteers, commanded by Colonel Bloodgood.	1	4	300	1	5	.....	Official reports. Post surrendered to Forrest.
Mar. 25th..	Franklin and Little Harpeth, Tennessee.	4th and 6th Kentucky, 9th Pennsylvania, and 2d Michigan Cavalry, commanded by Brigadier General G. C. Smith.	4	19	40	.....	.....	.....	Official.
Mar. 28th..	Pattersonville, Louisiana	Gunboat Diana, with detachments of the 12th Connecticut and 160th New York Volunteers on board.	4	14	99	.....	.....	.....	Report of Adjutant General of Connecticut, 1864, page 135.
Mar. 28th..	Hurricane Bridge, West Virginia	Four companies of the 13th West Virginia Volunteers..	4	3	.....	.....	4	4	Report of Adjutant General of West Virginia, 1864, page 371.
Mar. 28th..	Amite River, Louisiana	14th and 24th Maine Volunteers	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Maine, 1863, p. 81.
Mar. 29th..	Somerville, Tennessee	6th Illinois Cavalry	9	29	.....	.....	.....	.....	Report of Adjutant General of Illinois, Vol. III, page 65.
Mar. 29th..	Expedition to Jacksonville, Florida	8th Maine and 6th Connecticut Volunteers, and 33d U. S. Colored Troops (1st South Carolina).	2	3	.....	.....	.....	.....	Official Report of Colonel John D. Rust, 8th Maine Volunteers, commanding. Slight skirmish at Baldwin.
Mar. 29th..	Williamsburg, Virginia	5th Pennsylvania Cavalry	2	6	3	.....	.....	.....	Unofficial.
Mar. 30th..	Tahliquah, Indian Territory	3d Kansas Indian Home Guards	2	.....	.....	.....	.....	.....	Official.
Mar. 30th..	Massacre on the steamer Sam Gaty, at Sibley's Landing, Missouri.	Civilians, Missouri Militia, and contrabands	12	1	.....	.....	.....	.....	Newspaper report.
Mar. 30th..	The Island, Missouri	3d Wisconsin Cavalry	1	2	.....	.....	.....	.....	Official.
Mar. 30th..	Dutton's Hill, Kentucky	1st Kentucky and 7th Ohio Cavalry, and 44th and 45th Ohio Mounted Volunteers.	10	25	.....	.....	.....	290*	Official Report of Brigadier General Q. A. Gilmore, commanding. Also designated Somerset.
Mar. 30th..	Point Pleasant, West Virginia	One company of 13th West Virginia Volunteers, commanded by Captain J. D. Carter.	1	3	13	20	25	27	Report of Adjutant General of West Virginia, 1864, page 371.
Mar. 30th..	Richmond, Louisiana	69th Indiana Volunteers and a detachment of the 2d Illinois Cavalry.	.....	.....	.....	.....	7	4	Official Report of Major General J. A. McClernand. Also designated Round Away Bayou.
Mar. 30th to Apr. 4th.	Washington, North Carolina	Troops commanded by Major General Foster	.....	.....	.....	.....	.....	.....	Including the skirmish at Rodman's Point, April 4th, 1863.
April 1st..	Chalk Bluff, Arkansas	One company of the 2d Missouri Militia Cavalry	.....	.....	25	.....	.....	.....	Report of Adjutant General of Missouri, 1865, page 456.
April 1st..	Broad Run, Virginia	Detachments of the 1st Vermont and 5th New York Cavalry.	1	5	.....	.....	.....	.....	Official.
April 2d.	Little Rock Road, Arkansas	One company of the 5th Kansas Cavalry	1	1	.....	.....	.....	.....	Official.
April 2d and 3d.	Woodbury and Snow Hill, Tennessee...	3d and 4th Ohio Cavalry, commanded by General Stanley.	1	8	4	.....	50†	60	Ohio in the War, Vol. 2, page 768.
April 4th..	Carroll County, Arkansas	1st Arkansas Cavalry, commanded by Captain J. J. Worthington.	.....	1	.....	22	.....	7	
April 4th..	Madison, Arkansas	3d Iowa Cavalry	.....	.....	.....	.....	.....	56	Report of Adjutant General of Iowa, 1865, p. 114.

April 5th to 10th.	Black Bayou expedition, Mississippi	A division of the Fifteenth Corps, commanded by Major General Frederick Steele.	.....	.....	.....	.....	.....	.....	
April 7th.	Bombardment of Fort Sumter, Charleston Harbor, South Carolina.	South Atlantic squadron, Keokuk, Weehawken, Passaic, Montauk, Patapsco, New Ironsides, Catskill, Nantucket, and Nahant, commanded by Rear-Admiral S. F. Du Pont, U. S. N.	2	20	.....	4	10	.....	Official Reports of Union and Confederate commanders. Also designated Stono Inlet.
April 8th.	St. Francis County, Missouri	Detachment of cavalry and one company of the 4th Iowa Cavalry, commanded by Major E. F. Winslow.	1	4	.....	6	10	.....	Report of Adjutant General of Iowa, 1864, p. 529.
April 8th.	Broad River, South Carolina	3d Rhode Island Artillery, on the gunboat George Washington.	2	8	.....	.....	.....	.....	Unofficial.
April 9th.	East Pascagoula, Mississippi	74th U. S. C. T. (2d Louisiana), commanded by Colonel N. W. Daniels.	2	8	.....	20	.....	3	Official.
April 9th.	Blount's Mills, North Carolina	3d and 17th Massachusetts, 1st Rhode Island, and 3d New York Artillery.	.....	10	.....	.....	.....	.....	Report of Adjutant General of Massachusetts, 1863, page 650.
April 10th.	Waverly, Tennessee	One company of the 5th Iowa Cavalry	.....	.....	.....	3	.....	21	Official.
April 10th	Franklin and Harpeth River, Tennessee	40th Ohio, guarding the railroad, and a portion of Granger's Cavalry Division, commanded by Colonel Stanley.	.....	.....	100*	19	35	83	Official Report of Major General Granger.
April 10th.	Antioch Station, Tennessee	Detachment of the 10th Michigan Volunteers	8	12	.....	.....	.....	.....	Report of Adjutant General of Michigan, 1863, page 78.
April 11th.	Whittaker's Mills, near Williamsburg, Virginia.	5th Pennsylvania Cavalry	5	.....	19	.....	.....	.....	Confederate sources.
April 12th to 14th.	Irish Bend and Bisland, Louisiana	Grover's Division, Nineteenth Corps, at Irish Bend, and Emory's and Weitzel's Divisions, Nineteenth Corps, at Bisland.	.....	.....	370*	.....	400	2,000	Official Report of Major General Banks, commanding. Also designated Bayou Teche, Indian Ridge, and Centreville.
April 12th to May 4th.	Siege of Suffolk, Virginia	Troops of the Department of Virginia and North Carolina, commanded by Major General John J. Peck.	44	202	14	.....	500†	400	Casualty List, S. G. O. Official reports.
April 14th	West Branch and Nansemond, Virginia	Gunboats Commodore Barney, West End, Mount Washington, and Stepping Stones.	3	7	.....	.....	.....	.....	Official Report of Lieutenant W.B. Cushing, U.S.N.
April 15th.	Spanish Fork Cañon, Utah Territory	2d California Cavalry	1	4	.....	30	.....	.....	Official. Fight with Indians.
April 15th.	Pikeville, Kentucky	39th Kentucky Mounted Infantry	.....	.....	.....	.....	.....	78	Report of Adjutant General of Kentucky, Vol. II, page 425.
April 15th.	Dunbar's Plantation, Louisiana	2d Illinois Cavalry	1	2	2	.....	.....	2	Official Report of Major General J. A. McClernand.
April 16th.	Running the Vicksburg batteries	Ironclads and transports belonging to Commodore Porter's fleet and General Grant's army.	.....	.....	.....	.....	.....	.....	Official.
April 16th.	Medalia, Minnesota	Eighteen soldiers of the 7th Minnesota Volunteers	4	2	.....	.....	.....	.....	Fight with Indians. Also designated South Branch of the Watonwan.
April 17th.	South Quay, Virginia	99th and 130th New York Volunteers	2	3	.....	.....	.....	.....	Skirmish during the siege of Suffolk.
April 17th.	Bear Creek, Cherokee Station, and Lundy's Lane, Alabama.	10th Missouri and 7th Kansas Cavalry, of Major Gen. G. M. Dodge's forces.	.....	26	16	6	20	.....	Official reports, Union and Confederate. Also designated Hillsborough.
April 17th.	Bayou Vermilion, Louisiana	Division of the Nineteenth Corps, commanded by Brigadier General Grover.	.....	.....	.....	.....	.....	.....	Official Report of Major General Banks.
April 17th to May 2d.	Grierson's expedition from La Grange, Tennessee, to Baton Rouge, Louisiana.	6th and 7th Illinois and 2d Iowa Cavalry	.....	.....	.....	.....	100†	500	Official Report of Colonel B. H. Grierson, 6th Illinois Cavalry.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED	UNION LOSS. Killed.	Wounded.	Missing.	CONFED. LOSS. Killed.	Wounded.	Missing.	REMARKS AND REFERENCES.
April 18th.	Hernando, Mississippi	2d Brigade, Cavalry Division, commanded by General Smith, and a force of infantry and artillery from the Sixteenth Corps, commanded by Colonel Bryant, 12th Wisconsin Volunteers.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Wisconsin, 1865, page 481.
April 18th	Sabine Pass, Texas	Crews of the gunboats Cayuga and New London	1	5	5	.....	.....	.....	Unofficial.
April 18th	Fayetteville, Arkansas	1st Arkansas Volunteers and 1st Arkansas Cavalry	4	30	35	20	50	55	Official Report of Colonel M. LaRue Harrison, 1st Arkansas Cavalry, commanding post.
April 18th	Battery Huger, Hills Point, Virginia	Detachments of the 89th New York and 8th Connecticut Volunteers.	.....	.....	.....	.....	.....	129	Official. Skirmish during siege of Suffolk. (See April 12th.)
April 19th.	New Albany, Mississippi	7th Illinois Cavalry	.....	.....	.....	.....	.....	.....	Skirmish during Grierson's raid through Mississippi.
April 19th.	Coldwater, Mississippi	2d Brigade, Cavalry Division, commanded by General Smith, and a force of infantry and artillery from the Sixteenth Corps, commanded by Colonel Bryant, 12th Wisconsin Volunteers.	5	15	.....	20	40	75	Ohio in the War, Vol. 2, page 780. Report of Adjutant General of Wisconsin, pages 202 and 481.
April 20th	Celina, Kentucky	5th Indiana Cavalry	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Indiana, Vol. III, page 108.
April 20th	Patterson, Missouri	3d Missouri Militia Cavalry, commanded by Colonel Smart.	12	7	41	.....	.....	.....	Report of Adjutant General of Missouri, 1865, page 465.
April 20th	McMinnville, Tennessee	1st Brigade of Cavalry, Army of the Cumberland, commanded by Colonel Minty.	.....	.....	.....	.....	.....	.....	
April 20th	Bute La Rose, Louisiana	Union gunboats Estrella, Clifton, Arizona, and Calhoun, under Lieut. Commander A. P. Cooke, U. S. N.	.....	.....	.....	.....	.....	60	Official Report of Major General N. P. Banks.
April 21st and 22d.	Palo Alto, Mississippi	2d Iowa Cavalry, commanded by Colonel E. Hatch	.....	.....	6	.....	.....	.....	Skirmish during Grierson's expedition through Mississippi. (See April 17th.) Official Report of Colonel Hatch.
April 22d	Tompkinsville, Kentucky	.....	5	.....	.....	.....	.....	.....	Unofficial.
April 22d.	Strasburg Road, Virginia	3d West Virginia Cavalry, under Major McGee	1	1	.....	5	9	25	Unofficial.
April 23d.	Chuckatuck, Virginia	Crew of the gunboat Commodore Barney	1	.....	.....	2	.....	.....	Official Report of Lieutenant Cushing, U. S. N.
April 24th	Tuscumbia, Alabama	2d Division, Sixteenth Corps, commanded by Major General G. M. Dodge.	.....	.....	.....	.....	.....	.....	Unofficial.
April 24th	Beverly, West Virginia	5th West Virginia Cavalry, commanded by Colonel G. R. Latham.	2	10	.....	.....	.....	.....	Report of the Adjutant General of West Virginia, 1864, page 625.
April 24th.	White Water, Missouri	1st Wisconsin Cavalry	2	6	7	.....	.....	.....	Official.
April 24th	Little Rock Landing, Duck River Shoals, Tennessee.	Ellet's Mississippi ram fleet	2	1	.....	.....	25†	.....	Official Report of Lieutenant Fitch, U. S. N.
April 25th.	Greenland Gap, West Virginia	Detachments of the 23d Illinois and 14th West Virginia Volunteers, commanded by Captain Wallace, 23d Illinois.	2	4	60	.....	.....	100*	Official Report of Brigadier General B. F. Kelley.

April 26th	Cape Girardeau, Missouri	1st Wisconsin and 2d Missouri Militia Cavalry, 32d Iowa Volunteers, and Batteries D and L, 1st Missouri Light Artillery, commanded by Brigadier General John McNeil.	6	6	.....	60	.....	275§	Report of Adjutant General of Iowa, 1865, p. 302.
April 27th	Franklin, Tennessee	Cavalry, commanded by Colonel Watkins	.....	.....	.....	.....	.....	.....	
April 27th to May 3d.	Streight's raid from Tuscumbia, Alabama, to Rome, Georgia.	3d Ohio, 51st and 73d Indiana Volunteers. 80th Illinois Mounted Infantry, and two companies of the 1st Alabama Cavalry, commanded by Colonel A. D. Streight, 51st Indiana Volunteers.	12	69	1,466	.....	.....	.....	Official reports, Union and Confederate. Includes skirmishes at Day's Gap, April 30th, Black Warrior Creek, May 1st, and Blount's Farm, May 3d.
April 27th to May 8th.	Stoneman's Raid, Virginia	Cavalry Corps, Army of the Potomac, Major General Stoneman.	.....	.....	.....	.....	.....	.....	Averill's Division crossed the Rappahannock at Beverly Ford, advanced to the Rapidan, and returned. Buford's and Gregg's Divisions crossed at Kelly's Ford and proceeded to Louisa Court House, where detachments were sent out; one under Colonel Wyndham to Columbia destroyed a portion of the James Canal; one under Colonel Davis destroyed the Virginia Central Railroad from the South Anna River to Richmond; one under Colonel Kilpatrick destroyed a portion of the Fredericksburg Railroad at Hungary, passed within two miles of Richmond, crossed the Chickahominy, and proceeded to Tappahannock, and finally reached the Union lines at Gloucester.
April 28th	Howe's Ford, Kentucky	1st Kentucky Cavalry, commanded by Captain F. N. Alexander.	.....	.....	.....	.....	2	.....	Unofficial. Also designated Weaver's Store.
April 28th	Dover Road, North Carolina	Troop of the District of North Carolina, commanded by Brigadier General Palmer.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Massachusetts, 1863, page 314.
April 28th	Town Creek, Alabama	Portion of the Sixteenth Corps, commanded by Major General G. M. Dodge.	.....	.....	.....	1	3	.....	Official Report of General Bragg, C. S. A.
April 28th	Union Church, Mississippi	6th Illinois Cavalry	.....	.....	.....	.....	.....	.....	Skirmish during Grierson's raid through Mississippi, April 17th to May 2d.
April 29th	Castor River and Bloomfield, Missouri	1st Wisconsin Cavalry, of Brigadier General John McNeil's forces.	1	5	2	.....	.....	.....	Official.
April 29th	Fairmont, West Virginia	Detachments of the 106th New York, 6th West Virginia, and Virginia Militia.	1	6	.....	.....	.....	100*	Casualty List, S. G. O., File A, No. 618.
April 29th	Grand Gulf, Mississippi	Gunboats Louisville, Carondelet, Mound City, Pittsburg, Tuscumbia, Benton, and Lafayette.	26	54	.....	.....	.....	.....	Official Report of Admiral Porter, commanding.
April 29th and 30th.	Fitzhugh's Crossing, Rappahanock River, Virginia.	First Corps, Army of the Potomac	.....	.....	.....	.....	.....	103	Reports of Adjutants General of Michigan and Indiana.
April 30th and May 1st.	Chalk Bluff and St. Francois River, Missouri.	3d Missouri and 1st Iowa Cavalry, 2d Missouri Militia, and Battery E, 1st Missouri Light Artillery, of Brigadier General McNeil's forces.	2	11	4	.....	.....	.....	Official.
April 30th	Spottsylvania Court House, Virginia	6th New York Cavalry, commanded by Lieutenant Colonel Duncan McVicar.	.....	.....	58*	.....	.....	.....	
April 30th and May 1st.	Day's Gap, Sand Mountain, and Black Warrior Creek, Alabama.	3d Ohio and 80th Illinois, and 51st and 73d Indiana Mounted Infantry, and 1st Alabama Cavalry.	3	20	.....	5	50	.....	Official reports, Union and Confederate. Skirmishes during Streight's raid, April 27th to May 3d. Also designated Driver's Gap and Crooked Creek.
April 30th	Snyder's Bluff, Mississippi	Portion of the Fifteenth Corps, Major General Sherman.	.....	.....	.....	.....	.....	.....	Official.

* Killed, wounded, and missing. † Killed and wounded. § Wounded and missing.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
May 1st...	Port Gibson, Mississippi.....	Thirteenth Corps, Major General J. A. McClernand, and 3d division of the Seventeenth Corps, Major General J. B. McPherson, commanded by Major General U. S. Grant.	130	718	5	.....	1,150†	500	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 331. Official reports. Brigadier General R. D. Tracy, C. S. A., was killed. The first engagement in Grant's campaign against Vicksburg. Also designated Thompson's Hill and Magnolia Hills, and includes the skirmishes at Bayou Pierre.
May 1st to 4th.	Chancellorsville, Virginia.....	First Corps, Major General J. F. Reynolds; Second Corps, Major General D. N. Couch; Third Corps, Major General D. E. Sickles; Fifth Corps, Major General G. G. Meade; Sixth Corps, Major General J. Sedgwick; Eleventh Corps, Major General O. O. Howard; Twelfth Corps, Major General H. W. Slocum,—Army of the Potomac, commanded by Major General Joseph Hooker.	1,512	9,518	5,000	1,581	8,700	2,000	Official reports, Union and Confederate. Appendix to Part I, Medical and Surgical History of the War, page 135. List of casualties, S. G. O. Includes the battles of the Sixth Corps at Fredericksburg, Salem Heights, and Maryes Heights. Among the casualties in the Union army were Major General Hiram G. Berry and Brigadier Gen. A. W. Whipple, killed, and Brigadier Generals Devan and Kirby, wounded; in the Confederate army, Brigadier General E. F. Paxton, killed, and Lieutenant General J. S. Jackson, Major General A. P. Hill, and Brigadier Generals Hoke, Nichols, Ramseur, McGowan, Heth, and Pender, wounded.
May 1st...	La Grange, Arkansas	3d Iowa Cavalry, commanded by Captain J. Q. A. DeHuff.	3	9	30	.....	.....	.....	Report of Adjutant General of Iowa, 1864, p. 525.
May 1st...	Monticello, Kentucky.....	2d Tennessee, 1st Kentucky, and 2d and 7th Ohio Cavalry, and 45th Ohio and 112th Illinois Mounted Infantry, commanded by Brigadier General S. P. Carter.	.....	.....	.....	2	9	3	Official reports, Union and Confederate.
May 1st...	South Quay Bridge, Nansemond River, Virginia.	99th New York Volunteers.....	.....	41†	.....	.....	.....	.....	Skirmish during the siege of Suffolk. April 12 to May 4.
May 1st...	Tickfaw River, Mississippi	7th Illinois Cavalry	1	5	.....	8	.....	.....	Skirmish during Grierson's raid, April 17 to May 2.
May 1st...	Rapidan Station, Virginia.....	Averill's Cavalry Division, Army of the Potomac.....	.....	.....	.....	.....	.....	.....	Skirmish during Stoneman's raid, April 27 to May 8.
May 1st...	Louisa Court House, Virginia.....	Two companies of the 1st Maine Cavalry.....	2	.....	28	.....	4	.....	Report of Adjutant General of Maine, 1863, p. 53. Detachment of Stoneman's raiding forces.
May 2d....	Blount's Farm, Alabama.....	51st and 73d Indiana and 80th Illinois Volunteers, 3d Ohio Mounted Infantry, and 1st Alabama Cavalry.	.....	.....	.....	.....	.....	.....	Skirmish during Streight's raid, April 27 to May 3.
May 3d....	Warrenton Junction, Virginia.....	1st West Virginia and 5th New York Cavalry	1	16	.....	.....	15	23	Official.
May 3d....	Nansemond River, Virginia.....	Major General John J. Peek's troops.....	.....	.....	.....	.....	.....	.....	Official. Skirmish during siege of Suffolk, Virginia.
May 3d....	Forty Hills, Mississippi.....	Seventh division, Seventeenth Corps.....	.....	.....	.....	.....	.....	.....	Official. Skirmish during Grant's campaign against Vicksburg. Also designated Hankinson's Ferry.
May 4th...	Shannon Hill, Virginia.....	5th New York Cavalry.....	6	.....	15	.....	.....	.....	Official. Skirmish during Stoneman's raid.
May 4th...	Tunstall Station, Virginia	12th Illinois Cavalry.....	3	.....	.....	.....	.....	.....	Official. Skirmish on Stoneman's raid in Virginia.
May 4th...	Siege of Suffolk, Virginia, raised.....	Troops of the Depart't of Virginia and North Carolina.	.....	.....	.....	.....	.....	.....	Official Report of Major General John Peek.
May 6th...	Tupelo, Mississippi.....	10th Missouri and 7th Kansas Cavalry.....	1	6	.....	.....	.....	90	Unofficial.
May 10th...	Civiques Ferry, Louisiana	14th and 24th Maine and 177th New York Volunteers, and 21st New York Battery.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Maine, 1863, p. 82.

May 11th..	Horse Shoe Bend, Kentucky	Detachments of Union troops commanded by Colonel R. T. Jacobs.	10	20	40	.....	.....	100*	Report of Adjutant General of Michigan, 1863, page 99. Also designated Greasy Creek.
May 11th..	Mount Vernon, Arkansas	5th Kansas and 5th Illinois Cavalry, commanded by Colonel Powell Clayton.	1	14	.....	5	18	.....	Unofficial
May 12th..	Linden, Tennessee	6th Tennessee Cavalry, commanded by Colonel W. K. M. Breckenridge.	.....	.....	.....	3	.....	46	Official report of Commodore S. L. Phelps, U. S. N.
May 12th..	Fourteen-mile Creek, Mississippi	Thirteenth Corps, Major General J. A. McClernand, and Fifteenth Corps, Major General W. T. Sherman, of Major General Grant's army.	4	24	.....	.....	.....	.....	Official. Skirmish during Grant's campaign against Vicksburg.
May 12th..	Raymond, Mississippi	Seventeenth Corps, Major General J. B. McPherson's, of Major General Grant's army.	69	341	32	.....	.....	969*	Appendix to Part I, Medical and Surgical History of the War, page 331. Casualty List, S. G. O. Official Report. Engagement during Major General Grant's campaign against Vicksburg. The Confederate General Tilghman was killed.
May 13th..	Ponchatoula, Louisiana	Colonel Davis's command	.....	.....	.....	.....	.....	.....	
May 13th..	Hall's Ferry, Mississippi	2d Illinois Cavalry	.....	.....	.....	12	.....	30	Cavalry advance of McClernand's Corps in Grant's campaign against Vicksburg. Official.
May 13th..	South Union, Kentucky	.....	.....	.....	.....	.....	.....	.....	
May 14th..	Jackson, Mississippi	Seventeenth Corps, Major General J. B. McPherson, and Fifteenth Corps, Major General W. T. Sherman, of Major General Grant's army.	40	240	6	.....	.....	450*	Official Reports, Union and Confederate. Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 331. Engagement during Grant's campaign against Vicksburg.
May 14th..	Warrenton Junction, Virginia	.....	.....	3	.....	.....	.....	.....	
May 15th..	Camp Moore, Louisiana	Expedition commanded by Colonel Davis	.....	.....	.....	.....	.....	.....	
May 15th, and 16th.	Carsville and Suffolk, Virginia	Expedition commanded by Brigadier General R. S. Foster.	.....	.....	.....	.....	.....	.....	Casualty List, File A, No. 554, S. G. O. Also designated Holland House.
May 16th..	Carthage, Missouri	7th Missouri Militia Cavalry	3	1	.....	.....	.....	.....	Official.
May 16th..	Piedmont Station, Virginia	West Virginia and Pennsylvania Cavalry	2	.....	.....	2	.....	40	
May 16th..	Cripple Creek, Tennessee	Detachment of the 5th Tennessee Cavalry, escort to Brigadier General Palmer.	.....	.....	.....	.....	.....	18	Also designated Bradysville.
May 16th..	Champion Hills, Mississippi	Hovey's Division, Thirteenth Corps, Major General J. McClernand, and Seventeenth Corps, Major General J. B. McPherson.	426	1,842	189	.....	2,500 †	1,800	Official Reports of Major General Grant, commanding Union troops, and Lieutenant General Pemberton, commanding Confederate forces. Appendix to Part I, Medical and Surgical History of the War, page 331. Casualty List, S. G. O. Engagement during the campaign against Vicksburg. Also designated Baker's Creek and Edward's Station.
May 16th..	Berry's Ferry, Virginia	Detachment of the 1st New York Cavalry, commanded by Lieutenant Vermillion.	.....	.....	.....	2	5	10	Unofficial.
May 17th..	Big Black River, Mississippi	Carr's and Osterhaus's divisions of Thirteenth Corps, Major General J. B. McClernand,—Army of the Tennesse, Major General Grant.	29	242	2	.....	600 †	2,500	Official Reports of Major General Grant, commanding Union forces, and Lieutenant General Pemberton, commanding Confederates. Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 331. Engagement during Grant's campaign against Vicksburg.
May 17th to 20th.	Fayetteville, Virginia	12th and 91st Ohio Volunteers and 2d West Virginia Cavalry.	2	9	8	.....	.....	.....	Ohio in the War, Vol. 2, page 90.
May 18th..	Sherwood, Missouri	Detachments of the 2d Kansas Artillery and 1st Kansas (79th U. S Colored Troops) Volunteers.	19	2	4	.....	.....	.....	Official Report of Major R. G. Ward.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
May 18th..	Attack, by guerrillas, on the transport Crescent City, near Island No. 82.	3d Iowa Volunteers	.....	14	.....	.....	.....	.....	Report of the Adjutant General of Iowa, 1864, p. 424.
May 18th..	Carsville, Virginia	170th New York Volunteers fired into by their comrades.	3	4	.....	.....	.....	.....	Unofficial.
May 18th to July 4th.	Siege of Vicksburg, Mississippi	Thirteenth Corps, Major General J. A. McClernand, Fifteenth Corps, Major General W. T. Sherman, and Seventeenth Corps, Major General J. B. McPherson, commanded by Major General Grant, U. S. A., assisted by the navy on the Mississippi River, commanded by Admiral Porter. After the assault, Lauman's division, Smith's and Kimball's divisions of the Sixteenth Corps, two divisions of the Ninth Corps, Major General J. G. Parke, and a division from the Department of the Missouri, Major General F. J. Herron, were added to the besieging forces.	545	3,688	303	.....	.....	31,277	On May 19th, an unsuccessful assault on Fort Hill was made by Blair's division of Sherman's Corps. On the 20th, a general assault was made; Brig. General Green, C. S. A., was killed, and Brig. General Baldwin wounded. On June 25th a mine was exploded under the Fort Hill bastion, and a struggle followed in the breach. On the 28th, another breach was made in the Fort Hill bastion, and another hand-to-hand conflict ensued. On July 4th, the Confederates surrendered. Official Reports of Major General Grant, commanding Union forces, and Lieutenant General Pemberton, commanding Confederate forces. List of casualties, S. G. O. Appendix to Part I. Medical and Surgical History of the War, page 331.
May 19th..	Winchester, Virginia	Detachment of Cavalry from Milroy's command	.....	.....	.....	6	.....	7	Unofficial.
May 19th..	Richfield, Clay County, Missouri	25th Missouri Volunteers	2	1	40	.....	.....	.....	Official.
May 20th..	Fort Gibson and Fort Blunt, Indian Territory.	6th Kansas and 3d Wisconsin Cavalry, and 1st, 2d, and 3d Kansas Indian Home Guards.	25	12	.....	.....	.....	.....	Official Report of Colonel William A. Phillips, commanding.
May 20th..	Second assault on fortifications at Vicksburg, Mississippi.	Army of Tennessee	.....	.....	.....	.....	.....	.....	See siege of Vicksburg, May 18th.
May 20th to 28th.	Clendenin's raid below Fredericksburg, Virginia.	8th Illinois Cavalry, commanded by Lieutenant Colonel D. R. Clendenin.	.....	.....	.....	.....	.....	100	
May 21st...	Middleton, Tennessee	4th Michigan, 3d Indiana, 7th Pennsylvania, 3d and 4th Ohio, and 4th U. S. Cavalry, and 39th Indiana Mounted Infantry, commanded by Major General Stanley.	.....	.....	.....	.....	6	80	Official Report of Major General Halleck, U. S. A.
May 21st...	Plain Stores, Port Hudson Plains, La...	1st Division, Auger's, Nineteenth Corps	19	80	51	.....	.....	.....	Official Report of Major General Banks, commanding.
May 22d...	Gum Swamp, North Carolina	58th Pennsylvania and 5th, 25th, 27th, and 46th Massachusetts Volunteers, and Bogg's Battery, commanded by Colonel J. R. Jones, 58th Pennsylvania Vols.	.....	.....	.....	.....	.....	165	Official Report of Major General J. G. Foster, U. S. V.
May 23d...	Bachelor's Creek, North Carolina	58th Pennsylvania and 46th Massachusetts Volunteers, commanded by Colonel J. R. Jones.	.....	.....	.....	.....	.....	.....	Official.
May 23d...	Beaver Dam Lake, near Austin, Miss....	Mississippi Marine Brigade of Cavalry and Infantry	3	12	2	.....	.....	.....	Official.
May 25th..	Fishing Creek, Hartford, Kentucky	.....	.....	.....	.....	.....	.....	.....	Rebellion Record, Vol. VI, page 77.
May 25th..	Polk's Plantation, near Helena, Arkansas.	3d Iowa and 5th Kansas Cavalry	10	14	24	.....	.....	.....	Official.
May 25th..	Franklin, Louisiana	41st Massachusetts Volunteers and several other regiments, commanded by Colonel Chickering.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Massachusetts, 1863, page 893.
May 25th..	Senatobia, Mississippi	3d Illinois Cavalry, commanded by Colonel Lafayette McCrillis.	.....	.....	.....	6	3	.....	

May 27th..	Lake Providence, Louisiana	47th U. S. Colored Troops	1	1	6	.....	.....	.....	Official.
May 27th..	Florence, Alabama	Brigade of Cavalry, commanded by Colonel Cornyn, 10th Missouri Cavalry.	.....	.....	.....	.....	.....	.....	Official.
May 27th to July 9th.	Siege of Port Hudson, Louisiana	Major Generals Weitzel's, Grover's, Paine's, Augur's, and Dwight's Divisons of the Nineteenth Corps,—Major General Banks' Army of the Gulf, assisted by by the navy under Admiral Farragut.	500	2,500	.....	100	700	6,408	Official Reports of Major General Banks, commanding the Union forces, and Major General Frank Gardner, commanding the Confederate forces. Port Hudson was invested on May 24th. On the 27th a general assault was made, and the Confederates driven under the shelter of their fortifications. A serious engagement occurred on June 11th, and another general but unsuccessful assault was made on the 14th. On July 9th the Confederate garrison surrendered. Among the Union casualties were Brigadier Generals W. T. Sherman and H. E. Paine wounded. Appendix to Part I, Medical and Surgical History of the War, page 335.
May 28th..	Bushy Creek, Missouri	13th Illinois Cavalry, commanded by Major L. Lippert.	.....	.....	80*	.....	.....	.....	Official. Also designated Little Black River.
May 29th..	Mechanicsville, Mississippi	Portion of the Seventeenth Corps, commanded by Major General F. P. Blair, U. S. V.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1865, p. 214.
May 30th..	Greenwich, Virginia	1st Vermont, 5th New York, and 7th Michigan Cavalry	.....	.....	.....	1	2	1	Report of Adjutant General of Vermont, 1863, page 85.
June 1st...	Rocheport, Missouri	1st Missouri Enrolled Militia and 9th Missouri Militia Cavalry.	1	2	1	5	10	.....	Official.
June 4th...	Clinton, Louisiana	Cavalry, commanded by Colonel B. H. Grierson, 6th Illinois Cavalry.	.....	.....	.....	.....	21†	.....	Report of Adjutant General of Wisconsin, 1865, page 638.
June 4th...	Mechanicsburg and Sartoria, Mississippi	5th Illinois Cavalry and 8th Wisconsin Volunteers, portion of General Nathan Kimball's command.	.....	.....	.....	.....	.....	40	Report of Adjutant General of Illinois, Vol. III, page 54.
June 4th...	Frying Pan, Virginia	Detachment of the 5th Michigan Cavalry, commanded by Captain Gray.	3	7	7	.....	.....	.....	Official.
June 4th...	Franklin, Tennessee	85th Indiana Volunteers and 7th Kentucky Cavalry, commanded by Colonel J. P. Baird, 85th Indiana Volunteers, and the 4th and 6th Kentucky, 9th Pennsylvania, and 2d Michigan Cavalry, 1st Brigade General Granger's Cavalry Division.	.....	.....	25*	.....	.....	200*	Report of Adjutant General of Michigan, 1863, page 26.
June 4th...	Bluffton, South Carolina	.....	.....	.....	.....	.....	.....	.....	Official.
June 5th...	Franklin's Crossing, Rappahannock River, Virginia.	26th New Jersey and 5th Vermont Volunteers, and 15th and 50th New York Engineers, supported by the Sixth Corps.	6	35	.....	.....	.....	35	Unofficial.
June 6th...	Murfreesboro', Shelbyville Pike, Tennessee.	2d and 8th Indiana Cavalry, commanded by Colonel Thomas J. Harrison.	1	.....	.....	.....	.....	.....	Report of Adjutant General of Indiana, Vol. II, page 390.
June 6th...	Shawneetown, Kansas	.....	4	.....	.....	.....	.....	.....	Unofficial.
June 6th...	Berryville, Virginia	67th Pennsylvania Volunteers	.....	.....	.....	.....	.....	.....	Unofficial.
June 6th to 8th.	Milliken's Bend, Louisiana	5th U. S. Colored Heavy Artillery (9th Louisiana), 49th U. S. Colored Troops (11th Louisiana), 51st U.S. Colored Troops (1st Mississippi), and 23d Iowa Volunteers, commanded by Colonel H. Leib, 5th U. S. Colored Heavy Artillery.	154	223	115	125	400	200	Official Report of Brigadier General E. S. Dennis, U. S. V. Also designated Ashland. The Union troops engaged being mostly colored, no quarter was shown them.
June 9th...	Fort Lyons, Virginia	3d New York Artillery	20	14	.....	.....	.....	.....	Accidental explosion of a magazine.
June 9th...	Monticello and Rocky Gap, Kentucky	2d and 7th Ohio and 1st Kentucky Cavalry, and 45th Ohio and 3d Tennessee Mounted Infantry, commanded by Colonel A. V. Kautz, 2d Ohio Cavalry.	4	26	4	20	80	.....	Ohio in the War, Vol. 2, page 578.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
June 9th...	Beverly Ford and Brandy Station, Va...	2d, 3d, and 7th Wisconsin, 2d and 33d Massachusetts, 6th Maine, and 86th and 104th New York Volunteers; 1st, 2d, 5th, and 6th U. S., 2d, 6th, 8th, 9th and 10th New York, 1st Maryland, 8th Illinois, 3d Indiana, 1st New Jersey, 1st, 6th, and 17th Pennsylvania, 1st Maine, and 3d West Virginia Cavalry,—Brigadier Generals Gregg's and Buford's Cavalry Divisions, Army of the Potomac.	.....	.....	500*	.....	600†	100	Official Report of Major General Pleasanton, commanding. Casualty List, S. G. O.
June 9th...	Triune, Tennessee.....	General Mitchell's Cavalry Division.....	.....	.....	.....	.....	.....	100*	
June 10th..	Lake Providence, Louisiana.....	.....	.....	.....	.....	.....	.....	.....	Official Report of Major General Halleck.
June 11th..	State Creek, near Mount Sterling, Ky...	1st Tennessee and 14th Kentucky Cavalry, commanded by Colonel Sanders.	.....	.....	.....	.....	.....	.....	Official.
June 11th.	Port Hudson, Louisiana	Army of the Gulf.....	.....	.....	.....	.....	.....	.....	See siege of Port Hudson, May 24th.
June 11th..	Seneca, Maryland.....	6th Michigan Cavalry.....	4	1	.....	2	.....	.....	Unofficial.
June 11th..	Middleton, Virginia.....	13th Pennsylvania Cavalry, 87th Pennsylvania Volunteers, and Battery L, 5th Artillery.	.....	.....	.....	8	42	37	Official Report of Major General Milroy, commanding.
June 12th..	Berryville, Virginia.....	1st Brigade, Milroy's Division, commanded by Colonel McReynolds.	.....	.....	300	.....	.....	.....	
June 13th.. and 15th.	Winchester, Virginia.....	2d, 67th, and 87th Pennsylvania, 18th Connecticut, 12th West Virginia, 110th, 116th, 122d, and 123d Ohio, and 3d, 5th, and 6th Maryland Volunteers; 12th and 13th Pennsylvania, 1st New York, and 1st and 3d West Virginia Cavalry; Battery L, 5th U. S. Artillery, 1st West Virginia Battery, Baltimore Battery, and one company 14th Massachusetts Heavy Artillery, of the 2d Division, Eighth Corps.	.....	.....	3,000	.....	.....	850*	Official Report of Major General R. H. Milroy, commanding.
June 13th..	Wilson's Creek, near Boston, Kentucky..	Kentucky Provost Guard.....	.....	.....	.....	4	.....	5	Unofficial.
June 14th..	Martinsburg, Virginia.....	106th New York and 126th Ohio Volunteers, and West Virginia Battery, 3d Brigade, 2d Division, Eighth Corps, commanded by Brigadier General Tyler.	.....	.....	200	1	2	.....	Ohio in the War, Vol. 2, page 649. Official Report of Lieutenant General R. E. Lee. C. S. A.
June 14th..	Second assault on fortifications at Port Hudson, Louisiana.	.....	.....	.....	.....	.....	.....	.....	Official. See siege of Port Hudson, May 24th.
June 15th..	Richmond, Louisiana.....	General Mower's Brigade and Ellet's Mississippi Marine Brigade.	.....	.....	.....	.....	.....	100	Official.
June 16th..	Triplett's Bridge, Fleming County, Kentucky.	10th and 14th Kentucky and 7th and 9th Michigan Cavalry, 15th Michigan Volunteers, and 11th Michigan Battery, commanded by Colonel De Courcey.	15	30	.....	.....	.....	.....	Unofficial.
June 16th..	Jornado Del Muerto, New Mexico.....	One company of the 1st New Mexico Cavalry.....	5	2	.....	.....	.....	.....	Official Report of Brigadier General Carleton.
June 17th..	Orleans, Indiana.....	Home Guards	.....	3	12	.....	.....	.....	Unofficial. Morgan's raid in Indiana and Ohio.
June 17th..	Aldie, Virginia	2d and 4th New York, 6th Ohio, 1st Massachusetts, 1st Maine, and 1st Rhode Island Cavalry, commanded by Colonel Kilpatrick.	24	41	89	.....	100	.....	Casualty List, S. G. O. Report of Adjutant General of Massachusetts, 1863, page 925. Official Report of Major General Pleasanton.
June 17th..	Westport, Missouri.....	Two companies of the 9th Kansas Volunteers	14	6	.....	.....	.....	.....	Official.

June 17th..	Capture of the Atlanta	U. S. ironclad Weehawken	.....	.....	.....	1	17	145	Official Report of Rear-Admiral S. F. Dupont, U. S. N.
June 18th..	Plaquemine, Louisiana	.....	.....	.....	68	.....	.....	.....	Official Report of Major General Banks.
June 19th..	Blue Island, near Leavenworth Indiana	Home Guards, commanded by Major Clendenin	.....	.....	.....	6	.....	70	Unofficial.
June 19th..	Middleburg, Virginia	1st Maine, 2d, 4th, and 10th New York, 4th and 16th Pennsylvania, and 6th Ohio Cavalry.	.....	47	.....	.....	.....	40	Casualty List, S. G. O. Official Report of Major General Pleasanton.
June 20th..	Rocky Crossing, Tallahatchee River, Mississippi.	9th Illinois Mounted Infantry and 5th Ohio Cavalry	7	28	30	.....	.....	.....	Ohio in the War, Vol. 2, page 782.
June 20th..	Greencastle, Pennsylvania	1st New York Cavalry	.....	.....	.....	.....	.....	20	Unofficial.
June 20th..	Warm Springs, Fort McRae, New Mexico.	Detachment of the 1st New Mexico Cavalry	2	6	.....	.....	.....	.....	Official Report of Brigadier General Carleton.
June 20th..	Pawnee Reservation	One company of the 2d Nebraska Cavalry	1	2	.....	.....	.....	.....	Official.
June 20th..	Jackson Cross Roads, Louisiana	Detachments of the 6th and 7th Illinois and 2d Rhode Island Cavalry, 52d Massachusetts Volunteers, and a section of artillery.	.....	4	4	1	4	7	Reports of Adjutant Generals of Massachusetts and Rhode Island.
June 20th..	Hernando, Mississippi	5th Ohio, 2d Illinois, and 1st Missouri Cavalry	.....	.....	400*	.....	.....	.....	Official.
June 20th and 21st.	La Fourche Crossing, Louisiana	Detachments of the 23d Connecticut, 176th New York, 26th, 42d, and 47th Massachusetts, and 21st Indiana Volunteers, commanded by Colonel A. Stickney, 47th Massachusetts Volunteers.	8	40	.....	53	150	16	Official Report of Major General N. P. Banks. Also designated Thibodeaux.
June 21st..	Upperville, Virginia	Cavalry Corps, Army of the Potomac	.....	94	.....	20	100	60	Official Report of Brigadier General A. Pleasanton, commanding. Casualty List, S. G. O.
June 21st..	Low Creek, West Virginia	.....	.....	.....	.....	.....	.....	.....	
June 22d..	Hill's Plantation, Mississippi	Portions of three companies of the 4th Iowa Cavalry, commanded by Major Parkell.	4	10	28	.....	.....	.....	Report of Adjutant General of Iowa, 1864, p. 530.
June 22d..	Cypress Bend, Mississippi River	Union gunboats	.....	.....	.....	.....	.....	.....	Unofficial.
June 23d..	Brashear City, Louisiana	Detachments of the 176th and 114th New York, 23d Connecticut, 42d Massachusetts, and 21st Indiana Volunteers, commanded by Major Anthony.	46	40	300	3	18	.....	Official Report of Major General N. P. Banks.
June 23d to 30th.	Rosecrans' campaign from Murfreesboro' to Tullahoma, Tennessee.	Fourteenth Corps, Major General G. H. Thomas; Twentieth Corps, Major General A. McD. McCook; Twenty-first Corps, Major General T. L. Crittenden; Reserve Corps, Major General G. Granger; and Cavalry Corps, Major General Stanley.—Army of the Cumberland, Major General W. S. Rosecrans.	85	462	13	.....	.....	1,634	Appendix to Part I, Medical and Surgical History of the War, page 266. Official Report of Major General Rosecrans, commanding. Includes Middleton, Hoover's Gap, Beech Grove, Liberty, June 23d, and Guy's Gap, June 27th.
June 24th..	Middleton, Shelbyville Pike, Tennessee.	1st Cavalry Division, Army of the Cumberland, advance of Major General Rosecrans's army.	.....	.....	.....	.....	.....	.....	Official report.
June 24th..	Hoover's Gap, Tennessee	17th and 72d Indiana, 123d and 98th Illinois Mounted Infantry, and 18th Indiana Battery, Wilder's Brigade,—advance of the Fourteenth Corps, Major Gen. G. H. Thomas.	.....	61	.....	50	400	.....	Official Report of Major General Rosecrans, commanding.
June 24th..	McConnellsburg, Pennsylvania	12th Pennsylvania Cavalry	.....	.....	.....	.....	.....	.....	Unofficial.
June 24th..	Chackahoola Station, Louisiana	Five companies of the 9th Connecticut Volunteers	.....	3	.....	.....	.....	.....	Official Report of Lieutenant Colonel R. Fitzgibbons, commanding.
June 25th..	Liberty Gap, Tennessee	Twentieth Corps, Major General A. McD. McCook, of the Army of the Cumberland.	40	100	.....	.....	.....	.....	Official Report of Major General Rosecrans. Also designated Beech Grove.
June 25th..	Fort Hill, Vicksburg	.....	.....	.....	.....	.....	.....	.....	See siege of Vicksburg, May 18th.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
June 26th..	South Anna, near Hanover Court-House, Virginia.	11th Pennsylvania Cavalry and 2d Massachusetts and 12th Illinois Volunteers.	.....	.....	.....		20	150	Report of Adjutant General of Massachusetts, 1863, page 935.
June 26th..	Baltimore Cross Roads, Virginia.....	Fourth Corps, commanded by Major General Keyes....	.....	.....	.....	.....	.....	.....	Unofficial.
June 27th..	Fairfax, Virginia	11th New York Cavalry, commanded by Major Remington.	.....	.....	80	.....	.....	.....	Unofficial.
June 27th..	Beaver Creek, Floyd County, Kentucky.	39th Kentucky Volunteers.....	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Kentucky, Vol. II, page 425.
June 27th..	Guy's Gap and Shelbyville, Tennessee..	Cavalry Division of the Army of the Cumberland, supported by Major General Granger's Infantry Division.	.....	.....	.....	.....	.....	760	Official Report of Major General Rosecrans.
June 28th..	Donaldsonville, Louisiana.....	28th Maine Volunteers and convalescents, commanded by Major J. D. Bullen, assisted by gunboats.	.....	.....	.....	39	112	150	Official Reports of Major General Banks, U. S. A., and General Greene, C. S. A. Report of Adjutant General of Maine, 1863, page 104.
June 28th..	Fort Hill, Vicksburg, Mississippi	.....	.....	.....	.....	.....	.....	.....	See Vicksburg, May 28th.
June 29th..	McConnellsburgh, Pennsylvania.....	1st New York Cavalry.....	.....	1	.....	2	.....	30	Unofficial.
June 29th..	Westminster, Maryland.....	Detachment of the 1st Delaware Cavalry, commanded by Major N. B. Knight.	2	7	.....	3	15	.....	Official.
June 29th..	Lake Providence, Louisiana.....	.....	.....	.....	118	.....	.....	.....	Confederate sources.
June 30th..	Sporting Hill, near Harrisburgh, Pennsylvania.	22d and 37th New York Militia and Lander's Battery, commanded by Colonel Roome, 37th New York Militia.	.....	1	10	.....	.....	.....	Official.
June 30th..	Hanover, Pennsylvania	3d Division (Brigadier General Kilpatrick), Cavalry Corps (Major General Pleasanton), Army of the Potomac.	12	43	.....	.....	75	60	Casualty List, S. G. O. Official Report of Major General Meade.
June 30th..	Bayou Tensas, Louisiana.....	Mississippi Brigade of Infantry and Cavalry, commanded by Colonel C. R. Ellet.	.....	.....	.....	.....	.....	.....	
July 1st...	Tullahoma, Tennessee	Occupied by Major General Rosecrans' army	.....	.....	.....	.....	.....	.....	
July 1st to 3d.	Gettysburg, Pennsylvania.....	First Corps, Major General J. F. Reynolds; Second Corps, Major General W. S. Hancock; Third Corps, Major General D. E. Sickles; Fifth Corps, Major General George Sykes; Sixth Corps, Major General J. Sedgwick; Eleventh Corps, Major General O. O. Howard; Twelfth Corps, Major General H. W. Slocum; and Cavalry Corps, Major General A. Pleasanton.—Army of the Potomac, commanded by Major General G. E. Meade.	2,834	13,709	6,643	3,500	14,500	13,621	Official reports, Union and Confederate. Appendix to Part 1, Medical and Surgical History of the War, page 140. Casualty List, S. G. O. Includes the cavalry skirmish at Hunterstown. Among the casualties in the national army were Major General John F. Reynolds, Brig. Generals Stephen H. Weed, Kosciusko Zook, and Elon J. Farnsworth, killed; Major Generals D. E. Sickles and W. S. Hancock, and Brigadier Generals Paul, T. A. Rowley, J. Gibbons, and F. C. Barlow, wounded. In the Confederate army, Major General Pender, Brigadier Generals R. B. Garnett, W. Barksdale, and Semmes, killed; Major Generals Hood, Trimble, and Heth, and Brigadier Generals Kemper, Scales, G. T. Anderson, Hampton, J. M. Jones, Jenkins, Pettigrew, and Posey, wounded.

July 1st to 26th.	Morgan's raid into Kentucky, Indiana, and Ohio.	Cavalry, commanded by Brigadier General E. H. Hobson.	.....	.....	.....	28	300	3,000	Skirmishes at Burkesville, July 2d; Columbia, 3d; Green River Bridge, 4th; Lebanon, 5th; Brandenburg, 8th; Corydon, Indiana, 9th; Vernon, 12th; capture of the greater part of Morgan's troops at Buffington Island, Ohio, 19th, and final capture at New Lisbon on the 26th.
July 1st and 2d.	Black River, at Messenger's and Bridgeport Ferries, Mississippi.	Portion of the Seventeenth Corps	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1865, p. 216.
July 1st and 2d.	Cabin Creek, Indian Territory	3d Wisconsin, 6th and 9th Kansas, and 2d Colorado Cavalry, 1st Kansas (79th U. S. C. T.) and 3d Kansas Indian Home Guards.	1	11	.....	.....	.....	.....	Report of Adjutant General of Wisconsin, 1865, page 619.
July 2d	Baltimore Cross Roads, Virginia	Portion of the Fourth Corps, commanded by Major General Keyes.	18	.....	.....	.....	.....	.....	Unofficial.
July 2d	Elk River, Tennessee	Cavalry, Army of the Cumberland	.....	.....	.....	.....	.....	.....	Official.
July 2d	Bottom's Bridge, Virginia	5th Pennsylvania Cavalry	4	.....	.....	.....	.....	25	Unofficial.
July 2d	Beverly, Virginia	10th West Virginia Volunteers and Battery G, West Virginia Artillery, commanded by Colonel Thomas Harris.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of West Virginia, 1864, page 286.
July 2d	Marrowbone, Kentucky	1st and 9th Kentucky Cavalry and 24th Indiana Battery	5	.....	15	.....	.....	.....	Morgan's raid. Also known as Burkesville.
July 2d	Springfield Landing, Louisiana	2d Rhode Island Cavalry	1	4	13	.....	.....	.....	Report of Adjutant General of Rhode Island, p. 431.
July 3d	Fairfield, Pennsylvania	6th U. S. Cavalry	.....	.....	.....	.....	.....	.....	Unofficial.
July 3d	Columbia, Kentucky	1st Kentucky and 2d Ohio Cavalry, and 45th Ohio Mounted Volunteers.	2	3	6	2	2	.....	Morgan's raid.
July 4th	University Place, Tennessee	6th Kentucky Cavalry, commanded by Colonel L. D. Watkins.	.....	12	.....	.....	40	.....	Unofficial.
July 4th	Green River Bridge, Kentucky	Five companies of the 25th Michigan Volunteers, commanded by Colonel O. H. Moore.	6	23	.....	50	200	.....	Report of Adjutant General of Michigan, 1863, page 109. Also designated Tebb's Bend. Morgan's raid.
July 4th and 5th.	Bolton and Birdsong Ferry, Big Black River, Mississippi.	Nationals, commanded by Major General W. T. Sherman.	.....	.....	.....	.....	.....	2,000	
July 4th	Vicksburg, Mississippi, surrendered.		.....	.....	.....	.....	.....	.....	See May 18th, siege of Vicksburg.
July 4th	Helena, Arkansas	One division of the Sixteenth Corps, commanded by Major General B. M. Prentiss, assisted by the Union gunboat Tyler.	57	117	32	173	687	776	Official reports. Union and Confederate. Casualty List, S. G. O.
July 4th	Monterey Gap and Smithsburg, Maryland.	3d Cavalry Division, Kilpatrick's, Army of the Potomac	.....	30†	.....	.....	30†	100	Unofficial.
July 5th	Fairfield, Pennsylvania	Cavalry of the Army of the Potomac	.....	.....	.....	.....	.....	.....	Official.
July 5th	Lebanon, Kentucky	20th Kentucky Volunteers, commanded by Colonel C. S. Hanson.	9	15	400	3	6	.....	Report of Adjutant General of Kentucky. Vol. II, page 67.
July 6th	Pound Gap expedition, Tennessee	10th Kentucky and 1st Ohio Cavalry, commanded by Major J. M. Brown, 10th Kentucky Cavalry.	1	14	.....	30	30	125	Unofficial.
July 6th	Quaker Bridge, North Carolina	9th New Jersey, 17th, 23d, and 27th Massachusetts, and 81st and 158th New York Volunteers, and Belger's and Angel's Battery, commanded by Brigadier General C. A. Heckman.	.....	.....	.....	.....	.....	.....	New Jersey and the Rebellion, page 233. Also designated Comfort.
July 6th	Hagerstown, Maryland	3d Cavalry Division, Kilpatrick's, Army of the Potomac	.....	.....	.....	.....	.....	.....	Unofficial.
July 6th	Williamsport, Maryland	3d Cavalry Division, Army of the Potomac, commanded by Brigadier General Kilpatrick.	.....	.....	.....	.....	.....	.....	Unofficial.

† Killed and wounded.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
July 6th...	Jones' Ford, Black River, Mississippi ...	6th Iowa and 48th Illinois Volunteers, a portion of the troops commanded by Major General W. T. Sherman.	1	7	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1864, p. 435.
July 7th and 9th.	Iuka, Mississippi.....	10th Missouri and 7th Kansas Cavalry, commanded by Colonel F. M. Cornyn, 10th Missouri Cavalry.	5	3	3	.....	.....	.....	Report of Adjutant General of Missouri, 1865, p 369.
July 7th to 9th.	Boonsboro', Maryland.....	1st Division, Buford's, and 3d Division, Kilpatrick's,—Cavalry Corps, Army of the Potomac.	9	45	.....	.....	.....	.....	Unofficial.
July 7th...	Grand Pass, Fort Halleck, Idaho Territory.	9th Kansas Volunteers.....	1	6	.....	.....	.....	.....	Official. Indian fight; 21 Indians killed and 39 wounded.
July 7th...	Redwood Creek, California	One company of the 1st Battalion of the California Mountaineers.	.....	10	.....	.....	.....	.....	Official. Engagement with Indians.
July 7th...	Convalescent Corral, near Corinth, Mississippi.	One company of the 39th Iowa Volunteers, commanded by Captain Loomis.	.....	.....	21	2	.....	.....	Report of Adjutant General of Iowa, 1864, p. 507.
July 7th...	Harper's Ferry Bridge, Virginia.....	Potomac Home Brigade and 1st Massachusetts Heavy Artillery, commanded by Brigadier General J. R. Kenly.	.....	17	.....	.....	.....	.....	Report of Adjutant General of Massachusetts, 1863, page 956.
July 8th...	Bradenburg, Kentucky.....	Indiana Home Guards.....	2	2	45	.....	.....	.....	Morgan's raid.
July 9th...	Port Hudson, Louisiana, surrendered....	Army of the Gulf.....	.....	.....	.....	.....	.....	.....	See siege of Port Hudson, May 24th.
July 9th...	Corydon, Indiana.....	Indiana Home Guards, commanded by Colonel Lewis Jordan.	3	12	345	8	33	.....	Morgan's raid. Report of Adjutant General of Indiana.
July 9th to 16th.	Jackson, Mississippi.....	Ninth Corps, Major General Parke; Thirteenth Corps, Major General E. O. C. Ord; FifteenthCorps, Major General W. T. Sherman, and a portion of the Sixteenth Corps, of Major General U. S. Grant's forces.	100	800	100	71	504	764	Official reports, Union and Confederate. Includes skirmishes at Rienzi, Bolton Depot, Canton, and Clinton. Appendix to Part I, Medical and Surgical History of the War, page 334. Casualty List, S. G. O.
July 10th to Sep. 6th.	Fort Wagner, Morris Island, South Carolina.	Troops of the Deparment of the South, commanded by Major General Q. A. Gillmore, and U. S. Navy, under Admiral Dahlgren.	.....	.....	.....	.....	.....	.....	Appendix to Part I, Medical and Surgical History of the War, page 241. List of casualties, File A, No. 167, S. G. O.
July 10th and 11th.	Assault on Fort Wagner	67th Connecticut, 76th Pennsylvania, 9th Maine, 3d New Hampshire, and 48th and 100th New York Vols.	100	.....	130§	.....	.....	294*	Official reports, Union and Confederate.
July 10th..	Union City, Tennessee.....	4th Missouri Cavalry.....	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1865, p. 299.
July 10th..	Big Creek, Arkansas.....	.....	.....	.....	.....	.....	.....	.....	
July 11th..	Hagerstown, Maryland	Cavalry, Army of the Potomac.....	.....	.....	.....	.....	.....	.....	Official.
July 12th..	Funkstown, Maryland.....	Infantry, cavalry, and artillery of the Army of the Potomac.	.....	.....	100§	.....	.....	.....	Official Report of Major General Meade, commanding.
July 12th.	Vernon, Indiana	Indiana Minute Men	.....	.....	.....	.....	.....	.....	Morgan's raid.
July 12th..	Ashby Gap, Virginia.....	2d Massachusetts Cavalry.....	2	8	3	.....	.....	.....	Report of Adjutant General of Massachusetts, 1863, page 937.
July 13th..	Yazoo City, Mississippi	Major General Herron's Division, assisted by three gunboats under Admiral Porter.	.....	.....	.....	.....	.....	250	Official reports, Union and Confederate.

July 13th..	Jackson, Tennessee	3d Michigan, 2d Iowa, and 1st Tennessee Cavalry, and 9th Illinois Volunteers.	2	20	2	38	150	.....	Official Report of Colonel Hatch, 2d Iowa Cavalry, commanding 2d Brigade Cavalry, Sixteenth Corps.
July 13th..	Donaldsonville, Louisiana	Portions of Weitzel's and Grover's divisions of the Nineteenth Corps.	.....	.....	450*	.....	.....	.....	Report of Adjutant General of Massachusetts, 1863, page 803. Also designated Kock's Plantation.
July 13th to 15th.	Draft riots, New York City	.....	.....	.....	.....	.....	.....	.....	Over 1,000 of the rioters were killed and wounded.
July 14th..	Lawrenceburg, Ohio	105th Indiana Minute Men	8	20	.....	.....	.....	.....	While marching to intercept Morgan's raiders, indiscriminate firing took place among the men.
July 14th..	Falling Waters, Maryland	3d Cavalry Division of the Army of the Potomac, commanded by Brigadier General Kilpatrick.	29	36	40	125†	.....	1,500	Official Report of Major General Meade. Major General Pettigrew, C. S. A., killed.
July 14th..	Elk River, Tennessee	Advance of the Fourteenth Corps, Major General G. H. Thomas,—Army of the Cumberland, Major Gen. W. S. Rosecrans.	10	30	.....	60	24	100	Unofficial.
July 14th..	Shady Spring, West Virginia	2d West Virginia Cavalry	2	3	.....	.....	.....	.....	Unofficial.
July 14th..	Near Bolivar Heights, Virginia	1st Connecticut Cavalry	.....	.....	.....	25	.....	.....	Report of Adjutant General of Connecticut, 1864, page 259.
July 15th..	Pulaski, Alabama	3d Ohio and 5th Tennessee Cavalry	.....	.....	.....	3	.....	50	Unofficial.
July 15th..	Halltown, Virginia	16th Pennsylvania and 1st Maine Cavalry, commanded by Colonel Gregg, 1st Maine Cavalry.	.....	25†	.....	.....	20†	.....	Report of Adjutant General of Maine, 1863, p. 55.
July 16th..	Jackson, Mississippi	.....	.....	.....	.....	.....	.....	.....	Evacuated by the Confederates. See July 9th.
July 16th..	Sheppardstown, Virginia	1st, 4th, and 16th Pennsylvania, 1st Maine, and 10th New York Cavalry, commanded by Colonel Gregg, 1st Maine Cavalry.	.....	.....	50	25	75	50	Report of Adjutant General of Maine, 1863, p. 55.
July 16th..	Secessionville, James Island, South Carolina.	Troops commanded by Brigadier General Terry	.....	.....	.....	3	12	3	Skirmish during the siege of Fort Wagner. See July 10th. Official reports.
July 17th..	Honey Springs, Elk Creek, Indian Territory.	2d, 6th, and 9th Kansas Cavalry, 2d and 3d Kansas Batteries, and 2d and 3d Kansas Indian Home Guards, commanded by Major General Blunt.	17	60	.....	150	400	77	Official Report of Major General Halleck.
July 18th..	Brandon, Mississippi	Portion of General Sherman's troops	.....	.....	.....	.....	.....	.....	
July 18th..	Rio Hondo, New Mexico	One company of the 1st New Mexico Cavalry	1	4	.....	.....	.....	.....	Official. Engagement with Indians.
July 18th..	Second assault on Fort Wagner, South Carolina.	54th Massachusetts (colored), 6th Connecticut, 48th and 100th New York, 3d and 7th New Hampshire, 76th Pennsylvania, 9th Maine, and 62d and 67th Ohio Volunteers.	.....	.....	1,500*	50	124	.....	See Fort Wagner, July 10th. Brigadier General G. C. Strong and Acting Brigadier General H. S. Putnam killed. Official reports, Union and Confederate.
July 18th..	Wytheville, West Virginia	34th Ohio Volunteers and 1st and 2d West Virginia Cavalry, commanded by Colonel John T. Toland, 34th Ohio Volunteers.	17	61	.....	75	.....	125	Official Report of Brigadier General Scammon.
July 18th..	Canton, Mississippi	2d Wisconsin, 5th Illinois, and 3d and 4th Iowa Cavalry; 76th Ohio, 25th and 31st Iowa, and 3d, 13th, and 17th Missouri Volunteers, and a battery of artillery.	.....	.....	.....	.....	.....	72	Official Report of Colonel Cyrus Bussey, commanding detachment of General Sherman's forces.
July 18th to 21st.	Raid, Tar River and Rocky Mount, North Carolina.	3d and 12th New York and 1st North Carolina Cavalry, commanded by Brigadier General Potter.	.....	60	.....	.....	.....	.....	Unofficial.
July 19th..	Buffington Island, Ohio	1st, 3d, 8th, 9th, 11th, and 12th Kentucky, 8th, 9th and 12th Michigan, 2d and 7th Ohio, and 5th Indiana Cavalry, 45th Ohio and 2d Tennessee Mounted Infantry, commanded by Brig.Generals Hobson and Shackleford, and militia and Union gunboats.	.....	25	.....	.....	100†	800	Capture of Morgan's raiders. Also designated St. George's Creek.

* Killed, wounded, and missing. † Killed and wounded. § Wounded and missing.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
July 21st..	Manassas Gap, Virginia	1st, 2d, and 5th U. S. Cavalry, advance cavalry, Army of the Potomac.	3	14	.....	.....	.....	.....	Casualty List, S. G. O.
July 21st and 22d.	Chester Gap, Virginia	8th New York, 3d Indiana, and 12th Illinois, advance cavalry, Army of the Potomac.	2	8	.....	.....	.....	.....	Casualty List, S. G. O.
July 22d...	Concha's Springs, New Mexico	One company of the New Mexico Cavalry	2	3	.....	.....	.....	.....	Official.
July 23d...	Wapping Heights, Virginia	Third Corps, Army of the Potomac, commanded by Major General Freneh.	30	80	.....	.....	300†	60	Casualty List, File A, No. 498, S. G. O. Also designated Manassas Gap. Brigadier General F. B. Spinola, U. S. V., wounded.
July 24th..	Big Mound, Dakota Territory	1st Minnesota Cavalry, 3d Minnesota Battery, and 6th, 7th, and 10th Minnesota Volunteers, commanded by Brigadier General H. H. Sibley.	4	4	.....	.....	.....	.....	Official. Fight with the Sioux Indians.
July 26th..	New Lisbon, Ohio	Portion of Brigadier General Shackleford's Cavalry	.....	.....	.....	23	44	304	Surrender of John Morgan and the remnant of his forces not captured at Buffington Island.
July 26th..	Dead Buffalo Lake, Dakota Territory	1st Minnesota Cavalry, 3d Minnesota Battery, and 6th, 7th, and 10th Minnesota Volunteers, commanded by Brigadier General H. H. Sibley.	1	.....	.....	.....	.....	.....	Official. Fight with the Sionx Indians.
July 26th..	Pattacassey Creek, North Carolina	Troops of the District of North Carolina, commanded by Brigadier General Heckman.	3	17	.....	.....	.....	50	New Jersey in the Rebellion, page 234. Also known as Mount Tabor Church.
July 28th.	Marshall, Missouri	4th Missouri Militia Cavalry	3	2	.....	.....	.....	.....	Official.
July 28th..	Richmond and Lexington, Kentucky	.....	.....	.....	.....	.....	.....	.....	
July 28th..	Coldwater, Mississippi	.....	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Illinois. Vol. III, page 96.
July 28th..	Stoney Lake, Dakota Territory	1st Minnesota Cavalry, 3d Minnesota Artillery, and 6th, 7th, and 10th Minnesota Volunteers.	1	2	.....	.....	.....	.....	Official Report of Brigadier General H. H. Sibley, commanding. Fight with the Sioux Indians.
July 28th..	St. Catherine's Creek, near Natchez, Mississippi.	Detachment of the 72d Illinois Volunteers, commanded by Captain Wm. James.	.....	.....	.....	.....	.....	50	Unofficial.
July 29th..	Paris, Kentucky	.....	.....	.....	.....	.....	.....	.....	Rebellion Record. Vol. VII, page 37.
July 30th..	Irvine, Estill County, Kentucky	14th Kentucky Cavalry, commanded by Colonel H. C. Lilly.	4	5	10	7	18	75	
July 30th..	Saline County, Missouri	1st and 4th Missouri Enrolled Militia, commanded by Captain Cannon.	2	.....	.....	.....	.....	.....	
July 30th..	Missouri River, Dakota Territory	1st Minnesota Cavalry, 3d Minnesota Battery, and 6th Minnesota Volunteers.	.....	.....	.....	.....	.....	.....	Official Report of Brigadier General H. H. Sibley. Fight with Indians.
Aug. 1st to 3d.	Rappahannock Station, Kelly's Ford, and Brandy Station, Virginia.	1st Division of Cavalry, commanded by Brigadier General Buford..	16	134	.....	.....	.....	.....	Official. Casualty List, S. G. O.
Aug. 3d...	Jackson, Louisiana	73d, 75th, and 78th U. S. Colored Troops	2	2	27	.....	.....	.....	Official.
Aug. 5th...	Dutch Gap, James River, Virginia	U. S. gunboats Commodore Barney and Cohassett	3	1	.....	.....	.....	.....	Unofficial.
Aug. 7th...	Waterford, Virginia	Detachments of the 1st Connecticut and 6th Michigan Cavalry, commanded by Captain Vinton, 6th Michigan Cavalry.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Connecticut, 1864. page 258.

Aug. 7th...	New Madrid, Missouri	One company of the 24th Missouri Volunteers	1	1	8				Official.
Aug. 9th...	Sparta, Tennessee	Cavalry of the Army of the Cumberland	6	25					
Aug. 13th..	Grenada, Mississippi	3d, 4th, 9th, and 11th Illinois, 3d Michigan, and 2d Iowa Cavalry, and 9th Illinois Volunteers, commanded by Colonel Phillips, 9th Illinois Volunteers.							Official.
Aug. 13th..	Pineville, Missouri	6th Missouri Militia Cavalry					65		Report of Adjutant General of Missouri, 1865, page 492.
Aug. 14th..	West Point, White River, Arkansas	Union gunboats Lexington, Cricket, and Mariner, with the 32d Iowa Volunteers.	2	7					Report of Adjutant General of Iowa, 1865. p. 303.
Aug. 18th..	Pasquotank, North Carolina	1st New York Mounted Rifles and 11th Pennsylvania Cavalry, commanded by Colonel B. F. Onderdonk.		2					
Aug. 18th.	Pueblo Colorado, New Mexico	Three companies of the 1st New Mexico Cavalry	2	3					Official.
Aug. 21st..	Lawrence, Kansas		140	24		40			Plunder and massacre by Quantrell.
Aug. 21st..	Coldwater, Mississippi	3d and 4th Iowa and 5th Illinois Cavalry, commanded by Colonel E. F. Winslow, 4th Iowa Cavalry.		10					Reports of Adjutant Generals of Iowa and Illinois.
Aug. 21st..	Chattanooga, Tennessee	Artillery of Major General Rosecrans' army							Official.
Aug. 24th..	Coyle Tavern, near Fairfax Court-House, Virginia.	2d Massachusetts Cavalry, commanded by Colonel Lowell.	2	3	9	2	4	6	Report of Adjutant General of Massachusetts, 1863, page 937.
Aug. 24th.	King George County, Virginia	3d Division, Kilpatrick's Cavalry Corps, Army of the Potomac.							Official.
Aug. 25th..	Waynesville, Missouri	Detachment of the 5th Missouri Militia Cavalry		2	8	5	7		Official.
Aug. 25th to 30th.	Averill's raid in West Virginia		3	10	60			30	Averill's command passed through Hardy, Pendleton, Highland, Bath, Greenbrier, and Pocahontas Counties.
Aug. 25th and 26th.	Brownsville, Arkansas	Davidson's Cavalry Division, Department of Missouri	1			3		1	Official Report of Major General Fred Steele, commanding.
Aug. 26th.	Perryville, Arkansas	6th Missouri Militia, 3d Wisconsin and 2d Kansas Cavalry, and 2d Indiana Battery.							Official.
Aug. 26th..	Rocky Gap, near White Sulphur Springs, Virginia.	2d and 3d West Virginia and 14th Pennsylvania Cavalry, and 3d and 8th West Virginia Volunteers.	16	113			156†		Official Report of Brig. General W. W. Averill, commanding. Casualty List, File A, No. 226, S. G. O.
Aug. 26th.	Vinegar Hill, Morris Island, South Carolina.	Troops commanded by Major General Q. A. Gillmore	10	17					See Fort Wagner, July 10th.
Aug. 27th..	Vicksburg, Mississippi	5th Heavy Artillery (U. S. Colored Troops)	1	2					Official.
Aug. 27th..	Clark's Neck, Lawrence, County, Ky.	39th Kentucky Volunteers							Report of Adjutant General of Kentucky, Vol. II, page 425.
Aug. 27th..	Bayou Metoe, Arkansas	Davidson's Cavalry Division, Department of the Missouri.	12	72	15				Official Report of Major General Steele, commanding.
Aug. 28th..	Maysville, Alabama	4th Kentucky Cavalry							
Aug. 29th..	Bottom's Bridge, Virginia	1st New York Mounted Rifles and 5th Pennsylvania Cavalry, commanded by Colonel B. F. Onderdonk.	1	2		4		5	Also designated Dry Creek.
Aug. 31st..	Austin, Arkansas	Davidson's Cavalry Division, Department of the Missouri.							Official.
Sept. 1st..	Bayou Metoe, Arkansas	Rice's Division, Department of Arkansas							Official Report of General Steele.

† Killed and wounded.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Sept. 1st...	Barbee's Cross-Roads, Virginia	Detachment of the 6th Ohio Cavalry, commanded by Major John Cryor.	2	4	24				Ohio in the War, Vol. 2, page 791.
Sept. 1st...	Devil's Back Bone, Arkansas	1st Arkansas Volunteers, 6th Missouri Militia, 2d Kansas Cavalry, and 2d Indiana Battery.	4	12		25	40		Also known as Fort Smith and Cotton Gap.
Sept. 3d to 5th.	White Stone Hill, Dakota Territory	2d Nebraska, 6th Iowa, and one company of the 7th Iowa Cavalry.	20	38		100		156	Official Report of Brigadier General Alfred Sully, commanding. Fight with Indians.
Sept. 5th..	Limestone Station, near Telford, Tenn.	Five companies of the 100th Ohio Volunteers	12	20	240	6	10		Ohio in the War, Vol. 2, page 547.
Sept. 5th..	Moorefield, Virginia	1st West Virginia Volunteers, commanded by Major E. W. Stephens.							Report of Adjutant General of West Virginia, 1864, page 75.
Sept. 6th...	Brandy Station, Virginia	Cavalry, Army of the Potomac							
Sept. 7th...	Evacuation of Battery Gregg and Fort Wagner, Morris Island, South Carolina.	Major General Q. A. Gillmore's troops and the U. S. Navy.						75	See Fort Wagner, July 10th. Official reports, Union and Confederate.
Sept. 7th..	Bear Skin Lake, Missouri	2d Missouri Cavalry		4					Official.
Sept. 7th..	Ashley's Mills, Arkansas	Davidson's Cavalry Division, Department of the Missouri.		5			5	1	Official Report of General Steele.
Sept. 7th..	Atchafalaya River, Louisiana	2d Brigade, 2d Division, Thirteenth Corps	1	8					
Sept. 8th..	Baton Rouge, Louisiana	4th Wisconsin Cavalry	2		2				Official.
Sept. 8th..	Night attack on Fort Sumter, South Carolina.	Four hundred and thirteen marines and sailors, commanded by Commander Stevens, U. S. N.	3		114				Official reports, Union and Confederate.
Sept. 8th..	Bath, Virginia	7th Pennsylvania Cavalry							
Sept. 8th..	Sabine Pass, Louisiana	U. S. Navy, escort to the troops of the Nineteenth Corps, commanded by Major General Franklin.	30		200				Official reports, Union and Confederate.
Sept. 9th..	Cumberland Gap, Tennessee	Cavalry Division, Brig. General J. M. Shackleford,—Army of the Ohio, Major General A. E. Burnside.						2,000	Official Report of Major General Halleck.
Sept. 9th..	Weber's Falls, Indian Territory	2d Colorado Cavalry							Official.
Sept. 9th..	Dardenelle, Arkansas	2d Kansas Cavalry and 2d Indiana Battery, commanded by Colonel Cloud.						100	Official.
Sept. 10th.	Graysville, Georgia	Cavalry, Army of the Cumberland							Official reports, Confederate.
Sept. 10th.	Little Rock, Arkansas	Troops of the Department of Arkansas, Major General Steele, and Cavalry Division of the Department of Missouri, General Davidson.							Official Report of Major General F. Steele, commanding.
Sept. 10th.	Brimstone Creek, Tennessee	11th Kentucky Mounted Volunteers, commanded by Colonel Love.				4	7	2	Unofficial.
Sept. 10th.	Knoxville, Tennessee, occupied	Army of the Ohio, Major General Burnside							Official reports.
Sept. 11th.	Ringgold, Georgia	Advance of the Twenty-first Corps, Crittenden's,—Army of the Cumberland.	8	19		3		18	Official Report of Major General Rosecrans, commanding.
Sept. 11th.	Dug, Alpine, and Steven's Gaps, Ga.	Advance of the Army of the Cumberland							Official Report of Major General Rosecrans, commanding. Also known as Davis' Cross Roads.

Sept. 11th.	Moorefield, West Virginia	.....	.....	15	120	.....	.....	.....	Report of Adjutant General of West Virginia, 1864, page 75.
Sept. 11th.	Waldron, Arkansas	14th Kansas Cavalry	1	2	.....	.....	.....	.....	Official.
Sept. 12th.	Sterling's Plantation, Louisiana	Battery E, 1st Missouri Artillery	3	3	12	.....	.....	.....	Official.
Sept. 12th.	Texas County, Missouri	5th Missouri Militia Cavalry, commanded by Captain Whyback.	.....	3	.....	.....	.....	20*	Official.
Sept. 13th.	Paris, Tennessee	.....	.....	.....	.....	6	21	84	Unofficial.
Sept. 13th.	Culpeper, Virginia	1st, 2d, and 3d Divisions, Cavalry Corps, Army of the Potomac.	3	40	3	10	40	75	Official Report of Major General Meade. Casualty List, S. G. O.
Sept. 13th.	Lett's Tan Yard, near Chickamauga, Georgia.	Wilder's Brigade of Mounted Infantry,—advance of the Twenty-first Corps of General Rosecrans' army.	.....	50†	.....	10	40	.....	Official.
Sept. 14th and 16th.	Brownsville, Arkansas	5th Kansas Cavalry	.....	.....	.....	.....	.....	.....	
Sept. 14th.	Raccoon Ford, Rapidan Station, Virginia.	Cavalry Corps, Army of the Potomac	8	40	.....	.....	.....	.....	Official. Casualty List, S. G. O.
Sept. 14th.	Seneca Station, Buffalo Creek, Indian Territory.	1st Arkansas Volunteers, commanded by Colonel M. L. Harrison.	.....	.....	.....	5	.....	.....	
Sept. 14th.	Vidalia, Louisiana	3d Missouri Volunteers, commanded by Colonel Farrar.	2	4	.....	6	11	2	Official.
Sept. 15th.	Hendricks, Mississippi	10th Missouri Cavalry	.....	.....	.....	.....	.....	.....	
Sept. 15th.	Smithfield, Virginia	Detachments of the 1st New York and 12th Pennsylvania Cavalry, commanded by Captain Jones, 1st New York Cavalry.	.....	2	.....	.....	.....	10	
Sept. 19th.	Raccoon Ford, Virginia	Reconnoisance by 1st Cavalry Division, Buford's, Army of the Potomac.	4	19	.....	.....	.....	.....	Casualty List, S. G. O.
Sept. 19th and 20th.	Chickamauga, Georgia	Fourteenth Corps, Major General G. H. Thomas; Twentieth Corps, Major General A. McD. McCook; Twenty-first Corps, Major General T. L. Crittenden; and Reserve Corps, Major General G. Granger,—Army of the Cumberland, Major General W. S. Rosecrans.	1,644	9,262	4,945	2,389	13,412	2,003	Appendix to Part I, Medical and Surgical History of the War, page 265. Casualty List, S. G. O. Official Report of Major General Rosecrans, commanding. Among the casualties in the Union army were Brig. General W. H. Lytle, killed, and Brig. Generals Starkweather, Whittaker, and King, wounded; in the Confederate army, Brig. Generals Preston Smith, Deshler, and B. H. Helm, killed, and Major General J. B. Hood and Brig. Generals Adams, Brown, Gregg, McNair, Bunn, Preston, Cleburne, Benning, and Clayton, wounded.
Sept. 21st.	Bristol, Tennessee	Cavalry Brigade, Foster's; Cavalry Division, Shackleford's.—Army of the Ohio, Major General A. E. Burnside.	.....	.....	.....	.....	.....	.....	Official.
Sept. 21st.	White's Ford, Virginia	Cavalry of the Army of the Potomac	.....	.....	25*	.....	.....	.....	Report of Adjutant General of Michigan, 1863.
Sept. 22d.	Johnson Depot, Tennessee	8th Tennessee Volunteers	.....	2	.....	.....	.....	.....	Report of Adjutant General of Tennessee, 1866, page 158.
Sept. 22d.	Jack's Shop, Madison Court-House, Tennessee.	1st Division Buford's Cavalry Corps, Army of the Potomac.	1	20	.....	.....	.....	45	Casualty List, S. G. O.
Sept. 22d.	Carter's Station, Tennessee	3d Brigade, Cavalry Division, Army of the Ohio, Major General Burnside.	.....	.....	.....	.....	.....	.....	
Sept. 22d.	Blountsville, Tennessee	2d Mounted Brigade Cavalry Division of Major General Burnside's forces, commanded by Colonel Foster.	5	22	.....	15	50	100	
Sept. 22d.	Rockville, Maryland	11th New York Cavalry	.....	.....	.....	.....	34†	.....	

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS. Killed.	Wounded.	Missing.	CONFED. LOSS. Killed.	Wounded.	Missing.	REMARKS AND REFERENCES.
Sept. 24th.	Zollicoffer, Tennessee	3d Brigade, Cavalry Division, Army of the Ohio, Major General Burnside.	.....	.....	.....	.....	.....	.....	
Sept. 25th	Upperville, Virginia	1st Maryland Potomac Home Brigade of Cavalry	.....	.....	.....	1	.....	9	
Sept. 25th.	Red Bone Church, Missouri	2d Wisconsin Cavalry	.....	.....	.....	.....	.....	.....	
Sept. 26th.	Calhoun, Tennessee	Cavalry of the Army of the Ohio	6	20	40	.....	.....	.....	Report of Adjutant General of Michigan, 1863. Also called Hagnewood Prairie.
Sept. 27th.	Moffat's Station, Franklin County, Arkansas.	Detachment of the 1st Arkansas Volunteers, commanded by Captain Parker.	2	2	15	5	20	.....	
Sept. 28th.	McMinnville, Tennessee		.....	.....	.....	.....	.....	.....	
Sept. 29th.	Sterling's Farm, near Morganzia, Louisiana.	19th Iowa and 26th Indiana Volunteers	14	40	400	.....	.....	.....	Reports of the Adjutant Generals of Iowa and Indiana.
Sept. 30th.	Swallow's Bluff, Tennessee	7th Kansas and 7th Illinois Cavalry, commanded by Colonel Rowett.	2	6	.....	.....	.....	26	Official.
Oct. 1st.	Anderson's Gap, Tennessee	21st Kentucky Volunteers	.....	.....	38*	.....	.....	.....	Report of Adjutant General of Kentucky, Vol. II, page 96.
Oct. 2d.	Anderson's Cross Roads, Tennessee	1st Wisconsin, 2d Indiana, and 1st Tennessee Cavalry, 2d Brigade, 1st Division, Cavalry Corps, Army of the Cumberland, commanded by Colonel Edward McCook.	.....	70†	.....	.....	70†	200	Report of Adjutant General of Wisconsin, 1865, page 589.
Oct. 3d.	Thompson Cove, Tennessee	1st Brigade, Colonel Minty's, 2d Division Cavalry and Wilder's Brigade of Mounted Infantry, commanded by General Crook.	.....	.....	.....	6	.....	26	
Oct. 3d.	McMinnville, Tennessee	4th Tennessee Volunteers	7	31	350	.....	23†	.....	Report of Adjutant General of Tennessee, 1866, page 98.
Oct. 4th.	Murfreesboro' Road, Tennessee	2d Kentucky Cavalry and Wilder's Brigade of Mounted Infantry, commanded by General Crook.	.....	.....	.....	.....	.....	.....	
Oct. 4th.	Newton, Louisiana		1	4	.....	.....	.....	.....	Unofficial.
Oct. 4th.	Neosho, Missouri	Three companies of the 6th Missouri Militia Cavalry	1	14	43	.....	.....	.....	Report of Adjutant General of Missouri, 1865, page 492.
Oct. 5th.	Stockade at Stone River, Tennessee	One company of the 19th Michigan Volunteers	.....	6	44	.....	.....	.....	Report of Adjutant General of Michigan, 1863, page 97. Confederate official reports.
Oct. 5th.	Harper's Ferry, Virginia		1	3	10	.....	.....	.....	
Oct. 5th.	Near Blue Springs, Tennessee	Portion of General Burnside's forces	3	4	6	.....	.....	.....	Ohio in the War, Vol. 2, page 558.
Oct. 5th.	New Albany, Mississippi		.....	.....	.....	.....	.....	.....	
Oct. 5th.	Glasgow, Kentucky	37th Kentucky Mounted Infantry	.....	3	100	.....	13	.....	Official.
Oct. 5th.	Wartrace, Tennessee	5th Iowa Cavalry	.....	.....	.....	.....	.....	30*	Report of Adjutant General of Iowa, 1864, p. 993.
Oct. 6th.	Baxter Springs, near Fort Scott, Ark.	Detachments of the 3d Wisconsin and 14th Kansas Cavalry, and 12th Kansas Volunteers (83d U. S. Colored Troops),—escort to Major General Blunt.	54	18	5	.....	.....	.....	Official reports. The prisoners were robbed and murdered by the rebels, who were commanded by Quantrell.

Oct. 6th...	Fort Blair, Waldron, Arkansas	Detachment of the 3d Wisconsin Cavalry						30*	Report of Adjutant General of Wisconsin, 1865, page 620 (October 16th).
Oct. 7th...	Como, Mississippi				37*				
Oct. 7th ...	Shelbyville Pike, near Farmington, Tennessee.	1st, 3d, and 4th Ohio and 2d Kentucky Cavalry of the 2d Brigade, Long's, 2d Cavalry Division, and Wilder's Brigade of Mounted Infantry.	15	60		10	60	240	Official.
Oct. 8th...	Charlestown, Virginia		11	10					
Oct. 8th...	Salem, Mississippi	Colonels McCrellis' and Phillips' Cavalry Brigades		15†			15†		Casualty List, File A, No. 161, S. G. O. Report of Adjutant General of Tennessee, 1866, p. 475.
Oct. 8th...	Warsaw, Missouri	7th Missouri Militia Cavalry	1	3					
Oct. 9th...	Sugar Creek, near Pulaski, Tennessee	3d Brigade, Lowe's, 2d Cavalry Division, commanded by General Crook.		2				95	Report of Adjutant General of Iowa, 1864, p. 994.
Oct. 10th..	Rapidan, Virginia	1st Division Cavalry, Buford's, Army of the Potomac		20					Official reports.
Oct. 10th..	Ingraham's Plantation, Mississippi	2d Wisconsin Cavalry							
Oct. 10th..	James City, Rappahannock Virginia	3d Cavalry Division, Brigadier General Kilpatrick, Army of the Potomac, commanded by Major General Pleasanton.	10	40					Official reports, Union and Confederate. Also designated Robertson's Run.
Oct. 10th..	Blue Springs, Tennessee	Cavalry Division, Shackleford's, and infantry of the Ninth Corps, Army of the Ohio, Major General Burnside.			100*		66†	150	Official Report of Major General Burnside.
Oct. 10th..	Vermilion Bayou, Louisiana	1st Brigade, 1st Division of the Nineteenth Corps		5				5	Report of Adjutant General of Massachusetts, 1863, page 804.
Oct. 11th..	Rheatown, Tennessee	2d Brigade, Cavalry Division, Army of the Ohio			25*				Report of Adjutant General of Tennessee, 1865, page 525.
Oct. 11th..	Henderson's Mill, Tennessee	5th Indiana Cavalry of the 2d Brigade, Foster's, of the Cavalry Division commanded by General Shackleford.		11	8		30†	10	Report of Adjutant General of Indiana, Vol. III, page 111.
Oct. 11th..	Colliersville, Tennessee	66th Indiana Volunteers and 13th U. S. Regulars	15	50	20				Official.
Oct. 12th..	Jeffersonton, Virginia	2d Cavalry Division, Army of the Potomac	12	80	400				Official reports.
Oct. 12th..	Ingham's Mills, near Byhalia, Miss.	2d Brigade Cavalry of the Sixteenth Corps, commanded by Colonel E. Hatch, 2d Iowa Cavalry.		25†			50†		
Oct. 12th and 13th.	Culpeper and White Sulphur Springs, Virginia.	Cavalry Corps, Army of the Potomac	8	46					Casualty List, S. G. O. Official reports. Also designated Warrenton Springs.
Oct. 12th and 13th.	Merrill's Crossing to Lamine Crossing, Missouri.	1st, 4th, and 7th Missouri Militia Cavalry, Enrolled Militia Infantry, and 1st Missouri Militia Battery, commanded by Brigadier General E. B. Brown.	16			53	70		Official reports. Also known as Marshall, Arrow Rock, Blackwater, and Jonesboro'.
Oct. 13th..	Wyatts, Tallahatchie, Mississippi	2d Brigade, Cavalry Division of the Sixteenth Corps, commanded by Colonel Hatch, 2d Iowa Cavalry.		20†				75	
Oct. 13th..	Big Black River, Mississippi	Reconnoisance of infantry and cavalry, commanded by Major General McPherson.							
Oct. 13th..	Maysville, Alabama	1st Division Cavalry Corps, Army of the Cumberland							Report of Adjutant General of Wisconsin, 1865, page 590.
Oct. 13th..	Blountsville, Tennessee	3d Brigade, Carter's, of the Cavalry Division, Shackleford's, of the Army of the Ohio, Major General Burnside.		6		8	26	10	
Oct. 13th..	Bulltown, Braxton County, Virginia	Detachments of the 6th and 11th West Virginia Volunteers.				9	60		Official. Casualty List, File F, No. 86, S. G. O.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Oct. 14th..	Auburn, Virginia	Portion of the 1st Division, Second Corps, Army of the Potomac.	11	42	.....	8	24	24	Official.
Oct. 14th..	Bristoe Station, Virginia	Second Corps, Warren's; portion of the Fifth Corps, Sykes'; assisted by the 2d Cavalry Division, Gregg's,—Army of the Potomac.	51	329	.....	.....	750†	450	Casualty List, S. G. O. Official Reports of Major General Meade, U. S. A., and Lieutenant General A. P. Hill, C. S. A. Among the casualties in the Confederate army were Brigadier Generals H. F. Cooke, Posey, and Kirkland, wounded; in the Union army, Brig. General Malone, killed.
Oct. 14th..	Salt Lick, Virginia	6th West Virginia Volunteers	.....	.....	.....	.....	.....	.....	
Oct. 15th..	Canton, Mississippi	Portion of the Fifteenth and Seventeenth Corps, commanded by Major General McPherson.	.....	.....	.....	.....	200†	.....	
Oct. 15th..	McLean's Ford, Virginia	New Jersey Brigade, Third Corps, Army of the Potomac.	2	23	.....	.....	60†	.....	Also designated Liberty Mills.
Oct. 15th..	Hedgeville, Virginia	Detachments of the 1st New York and 12th Pennsylvania Cavalry and 116th Ohio Volunteers.	.....	.....	.....	4	2	36	Unofficial
Oct. 15th..	Blackburn Ford, Virginia	Portion of the Second Corps, Army of the Potomac	.....	.....	.....	.....	.....	.....	Official Report of Major General Meade.
Oct. 16th to 18th.	Brownsville, Mississippi	Portion of the Fifteenth and Seventeenth Corps, Major General McPherson.	.....	18	.....	.....	.....	.....	Report of Adjutant General of Illinois, Vol. III, page 54.
Oct. 16th..	Cross Timbers, Missouri	18th Iowa Volunteers	.....	.....	.....	2	8	.....	Report of Adjutant General of Iowa, 1865, p. 277.
Oct. 17th..	Destruction of two blockade runners in Tampa Bay.	Union gunboats Tahoma and Adele	3	10	5	.....	.....	.....	Official Report of Acting Rear-Admiral Bailey, U. S. N.
Oct. 17th..	Clinton, Mississippi	Detachment of the Army of the Tennessee, commanded by Major General McPherson.	.....	.....	.....	.....	.....	.....	
Oct. 17th..	Rapidan, Virginia	1st Division, Buford's, Cavalry Corps, Army of the Potomac.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O.
Oct. 17th..	Humansville, Missouri	6th Missouri Militia Cavalry	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Missouri, 1865, p. 493.
Oct. 18th..	Charlestown, Virginia	9th Maryland Volunteers	12	13	379	.....	.....	.....	Official Report of Brig. General Imboden, C. S. A.
Oct. 18th..	Berrysville, Virginia	34th Massachusetts Volunteers and 17th Indiana Battery.	2	4	.....	5	20	21	Official Report of Brig. General Imboden, C. S. A. Report of Adjutant General of Massachusetts, 1863, page 834.
Oct. 19th..	Buckland Mills, Virginia	3d Division, Kilpatrick's Cavalry Corps, Army of the Potomac.	20	60	100	10	40	.....	Official Reports of General Stuart and Lee, C. S. A., and Major General Meade, U. S. V.
Oct. 20th..	Barton Station, Mississippi	Troops of the Army of the Tennessee, Sherman's	.....	.....	.....	.....	.....	.....	
Oct. 20th and 22d.	Philadelphia, Tennessee	45th Ohio Mounted Infantry. 1st, 11th, and 12th Kentucky Cavalry, and 24th Indiana Battery, commanded by Colonel Wolford.	20	80	354	15	82	111	Official Report of Major General C. S. Stevenson, commanding Confederates.
Oct. 21st..	Cherokee Station, Alabama	1st Division, Osterhaus's, Fifteenth Corps, Army of the Tennessee.	7	37	.....	.....	40†	.....	Official reports.
Oct. 21st..	Opelousas, Louisiana	Franklin's Division, General Banks' troops	.....	.....	.....	.....	.....	.....	
Oct. 22d...	Beverly Ford and Rappahannock Crossing, Virginia.	2d Pennsylvania and 1st Maine Cavalry, commanded by Colonel Gregg, 1st Maine Cavalry.	6	.....	.....	.....	.....	.....	Report of Adjutant General of Maine, 1863, p. 56.

Oct. 22d...	New Madrid Bend, Tennessee	32d Iowa Volunteers							Report of Adjutant General of Iowa, 1865, p. 300.
Oct. 23d...	Supply train, Tullahoma, Tennessee	70th Indiana Volunteers							
Oct. 24th..	Bealton and Rappahannock Bridge, Va..	1st Division, Buford's, Cavalry Corps, Army of the Potomac.							
Oct. 24th..	Sweetwater, Tennessee	Cavalry of the Army of the Ohio					5		
Oct. 25th..	Colliersville, Tennessee								
Oct. 25th..	Pine Bluff, Arkansas	5th Kansas and 1st Indiana Cavalry	11	27	1	53	164	33	Official Report of Colonel Powell Clayton, commanding.
Oct. 25th..	Creek Ageney, Indian Territory	1st Kansas Indian Home Guards and 2d Indiana Battery.							Official.
Oct. 26th..	Cane Creek, Alabama	1st Division, Fifteenth Corps, commanded by Major General Osterhaus.	2	6		10	30		Official Report of General Sherman. Also designated Bear Creek and Tuscumbia.
Oct. 26th..	Philadelphia, Tennessee		3				3	5	Confederate official reports.
Oct. 26th..	Vincent's Cross Roads, Tishamingo County, Mississippi.	1st Alabama Union Cavalry, commanded by Colonel G. E. Spencer.	14	25					Official. Also known as Bay Springs. Casualty Return, S. G. O.
Oct. 27th..	Brown's Ferry, Tennessee	Detachments from the 5th, 6th, and 23d Kentucky, 1st, 6th, 41st, 93d, and 124th Ohio, and 6th Indiana Volunteers, of the 2d Brigade, Hazen's, 3d Division, Fourth Corps, Army of the Cumberland.	5	21	9			6	Official Report of Brigadier General W. F. Smith, commanding.
Oct. 27th..	Wauhatchie, Tennessee	Eleventh Corps, Major General O. O. Howard, and 2d Division, Geary's, Twelfth Corps, commanded by Major General Joseph Hooker.	76	339	22	300	1,200	100	Official Report of Major Gen. George H. Thomas, commanding Army of the Cumberland. Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 282.
Oct. 28th..	Clarksville, Arkansas	3d Wisconsin Cavalry							Report of Adjutant General of Wisconsin, 1865, page 620.
Oct. 28th..	Leiper's Ferry, Tennessee	11th and 37th Kentucky and 112th Illinois Volunteers ..	2	5	15				Official reports, Union and Confederate.
Oct. 29th..	Cherokee Station, Alabama	1st Division of the Fifteenth Corps, commanded by Major General Osterhaus.							
Nov. 1st...	Washington, North Carolina					5	8		Unofficial telegrams.
Nov. 1st...	Fayetteville, Tennessee	4th Indiana Cavalry							Report of Adjutant General of Indiana, Vol. III, page 20.
Nov. 2d...	Brazios De Santiago, Texas	Troops of the Thirteenth Corps, commanded by Brig. General N. J. T. Dana.							Official Report of Major General N. P. Banks.
Nov. 3d...	Centreville and Piney Factory, Tenn....	A mixed command, under Lieutenant Colonel Scully, 10th Tennessee Volunteers.				15		66	Official Report of Major General G. H. Thomas.
Nov. 3d...	Grand Coteau, Louisiana	3d Division, McGinnis', and 4th Division, Burbridge's, of the Thirteenth Corps, commanded by Major Gen. C. C. Washburn.	26	124	576	60	320	65	Official Report of Major General E. O. C. Ord. Also designated as Bayou Bourbeaux and Carrion Crow Bayou.
Nov. 3d...	Colliersville, Tennessee	Cavalry Brigade, Sixteenth Corps, commanded by Col. Hatch, 2d Iowa Cavalry.	4	16				14	
Nov. 4th...	Lawrenceburg, Tennessee	14th Michigan Mounted Infantry		3		8	7	24	Official Report of Major General Thomas.
Nov. 4th...	Moscow, Tennessee	Cavalry Brigade, Sixteenth Corps, commanded by Col. Hatch, 2d Iowa Cavalry.	3	41	41		100		
Nov. 4th.	Metly's Ford, Little Tennessee River ...	Cavalry of the Army of the Ohio, commanded by Gen. Sanders.						44	

† Killed and wounded.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Nov. 5th...	Mill Point, Pocahontas County, West Virginia.	14th Pennsylvania and 3d West Virginia Cavalry, commanded by Brigadier General W. W. Averill.	.....	.....	.....	.....	.....	.....	Official Report of Brigadier General B. F. Kelley.
Nov. 6th...	Kincaels, Tennessee	.....	.....	.....	33	.....	.....	.....	
Nov. 6th...	Rogersville, Tennessee	7th Ohio Cavalry, 2d Tennessee Mounted Infantry, and 2d Illinois Battery, commanded by Colonel Garrard, 7th Ohio Cavalry.	5	12	650	10	20	.....	Ohio in the War, Vol. 2, page 800. Official Report of Brig. General Ransom, C. S. A.
Nov. 6th...	Droop Mountain, Virginia.....	14th Pennsylvania and 2d and 5th West Virginia Cavalry; 8th and 10th West Virginia and 28th Ohio Volunteers, and Battery B, West Virginia Artillery, commanded by Brigadier General W. W. Averill.	31	94	1	50	250	100	Official Report of Brigadier General B. F. Kelley, U. S. V.
Nov. 7th...	Rappahannock Station, Virginia.....	5th Wisconsin, 5th and 6th Maine, 49th and 119th Pennsylvania, and 121st New York Volunteers, supported by the remainder of the Sixth Corps, Sedgwick's, and a portion of the Fifth Corps, Army of the Potomac.	.....	370†	.....	11	98	1,629	Official Reports of Major General Meade, commanding, and Lieutenant General Lee, C. S. A.
Nov. 7th...	Kelly's Ford, Virginia.....	1st U. S. Sharpshooters, 46th New York, 1st and 20th Indiana, 3d and 5th Michigan, and 110th Pennsylvania Volunteers, supported by the remainder of the Third Corps, Major General French, Army of the Potomac.	.....	70†	.....	5	59	295	Official Report of Major General Meade, U. S. V., and Lieutenant General R. E. Lee, C. S. A.
Nov. 7th...	Stevensburg, Virginia.....	3d Cavalry Division, Army of the Potomac, commanded by Brigadier General Kilpatrick.	.....	.....	.....	.....	.....	.....	
Nov. 8th...	Clarksville, Arkansas.....	3d Wisconsin Cavalry.....	2	.....	.....	.....	.....	.....	Report of Adjutant General of Wisconsin, 1865, page 620.
Nov. 8th...	Muddy Run, near Culpeper, Virginia...	1st Division, Cavalry Corps, Army of the Potomac....	4	25	.....	.....	.....	.....	Casualty List, S. G. O.
Nov. 9th...	Bayou Sara, Mississippi.....	.....	.....	.....	25	.....	3	.....	Confederate official reports.
Nov. 11th..	Natchez, Mississippi.....	58th U. S. Colored Troops (6th Mississippi).....	4	6	1	4	8	.....	Official.
Nov. 12th..	Roseville, Arkansas	Two companies 2d Kansas Cavalry	1	.....	5	.....	.....	.....	Official.
Nov. 13th..	Trinity River, California.....	Two companies 1st Battalion California Mountaineer Infantry.	.....	2	.....	.....	.....	.....	Official.
Nov. 13th..	Mill Creek Valley, West Virginia	.....	.....	.....	.....	.....	.....	.....	
Nov. 13th..	Palmyra, Tennessee	Mounted infantry, commanded by Captain Cutter.....	.....	2	.....	2	5	1	Official Report of Major General Thomas.
Nov. 14th..	Huff's Ferry, Tennessee	111th Ohio, 107th Illinois, 11th and 13th Kentucky, and 23d Michigan Vols., and 24th Michigan Battery.	.....	.....	100*	.....	.....	.....	
Nov. 14th..	Rockford, Tennessee.....	1st Kentucky Cavalry and 45th Ohio Mounted Infantry, commanded by Colonel S. G. Adams, 1st Kentucky Cavalry.	.....	25	.....	.....	.....	.....	Official.
Nov. 14th..	Marysville, Tennessee	11th Kentucky Cavalry	.....	.....	100*	.....	.....	.....	
Nov. 15th..	Loudon Creek, Tennessee.....	111th Ohio Volunteers	4	12	.....	6	10	.....	Ohio in the War, Vol. 2, page 591.
Nov. 15th..	Lenoirs, Tennessee	Cavalry and infantry of the Army of the Ohio, covering retreat of Major General Burnside's forces on Knoxville.	.....	.....	.....	.....	.....	.....	

Nov. 15th..	Holston River, near Knoxville, Tenn....	11th Kentucky, 45th Ohio, and 37th Kentucky Mounted Infantry, of the Army of the Ohio.	.....	.....	.....	.....	.....	.....	
Nov. 16th..	Charles City Cross Roads, Virginia.....	Cavalry expedition, commanded by Colonel West	2	5	.....	.....	.....	90	
Nov. 16th..	Campbell's Station, Tennessee.....	Ninth Corps, Major General Ferrero; 2d Division, Twenty-third Corps, Brig. General Julius White; and Cavalry, commanded by General Sanders,—Army of the Ohio, commanded by Major General A. E. Burnside.	60	340	.....	.....	.....	570*	Casualty List, S. G. O. Brigadier Generals Wm. P. Sanders and Warfield, wounded.
Nov. 17th to Dec. 4th.	Siege of Knoxville, Tennessee	Army of the Ohio, Major General Burnside	.....	.....	.....	.....	.....	.....	
Nov. 17th..	Willow Creek, California	1st California Battalion Mountaineer Infantry.....	.....	5	.....	.....	.....	.....	Official.
Nov. 17th..	Mount Jackson, Virginia	1st New York Cavalry.....	2	3	3	.....	.....	27	Official Report of Brig. General J. C. Sullivan.
Nov. 17th..	Mustang Island, near Aranzas Pass, Texas.	13th and 14th Maine, 34th Iowa, and 8th Indiana Vols., and Battery F, 1st Missouri Artillery, commanded by Brigadier General N. J. T. Dana.	.....	.....	.....	.....	.....	.....	Report of Major General N. P. Banks.
Nov. 18th..	Carrion Crow Bayou, Louisiana	6th Missouri Cavalry.....	.....	.....	.....	.....	.....	.....	
Nov. 19th..	Union City, Tennessee.....	2d Illinois Cavalry, commanded by Captain F. B. Moore.	1	.....	.....	11	.....	53	
Nov. 21st..	Water Proof, Louisiana.....	Steamer Welcome	.....	.....	.....	.....	.....	.....	
Nov. 23d to 25th.	Chattanooga, Tennessee	Fourth Corps, Major General G. Granger, and Fourteenth Corps, Major General J. M. Palmer,—Army of the Cumberland, Major General George H. Thomas; Eleventh Corps, Major General O. O. Howard, and Geary's Division of the Twelfth Corps, Major General Joseph E. Hooker; and Fifteenth Corps, Army of the Tennessee, Major General W. T. Sherman.	757	4,529	330	361	2,181	6,142	Official Report of Major General U. S. Grant, commanding. Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 283. In the battle of Chattanooga are included the engagements at Orchard Knob on the 23d, Lookout Mountain on the 24th, and Missionary Ridge on the 25th. Among the casualties were Brigadier Generals J. M. Corse, G. A. Smith, and Matthies, U. S. V., wounded.
Nov. 24th..	Barnwell's Island, South Carolina	33d U. S. Colored Troops (1st South Carolina), commanded by Captain Whitney.	2	7	.....	.....	.....	.....	Official.
Nov. 26th..	Bonfouca, Louisiana.....	31st Massachusetts Volunteers and 4th Massachusetts Battery, commanded by Captain G. S. Darling.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Massachusetts, 1863, page 985.
Nov. 26th..	Sparta, Tennessee.....	1st Tennessee and 9th Pennsylvania Cavalry, commanded by Lieut. Colonel J. P. Brownlow.	.....	.....	.....	1	2	10	Official Report of Major General Thomas.
Nov. 26th..	Beersheba Springs, Tennessee.....	Alabama and Tennessee Scouts, commanded by Captain Brixby.	.....	.....	.....	.....	.....	20	Official.
Nov. 25th..	Greenville, North Carolina.....	12th New York Cavalry, 1st North Carolina Volunteers, and 24th New York Battery, commanded by Captain G. W. Graham.	1	.....	.....	.....	.....	50	
Nov. 26th..	Warm Springs, North Carolina.....	.....	.....	30	.....	.....	.....	.....	
Nov. 26th..	Kingston, Tennessee.....	Cavalry of the Army of the Ohio, commanded by Col. Byrd.	.....	.....	.....	.....	.....	.....	
Nov. 26th to 28th.	Operations at Mine Run, Virginia	First Corps, Major General John Newton; Second Corps, Major General G. K. Warren; Third Corps, Major General French; Fifth Corps, Major General Sykes; Sixth Corps, Major General John Sedgwick; and 1st and 2d Divisions Cavalry,—Army of the Potomac.	100	400	.....	100	400	.....	List of casualties, S. G. O. Includes the engagements at Raccoon Ford, Bartlett's Mills, Robertson's Tavern, and New Hope, and is designated Locust Grove, Payne's Tavern, and Orange Grove. Official Reports of Major General Meade, commanding Union, and Lieut. General R. E. Lee, commanding Confederate forces. Among the casualties were Brigadier Generals J. M. Jones and J. E. B. Stuart, wounded.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1863.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Nov. 27th..	Ringgold, Greysville, Pea Vine Creek, and Taylor's Ridge, Georgia.	Johnson's Division, Fourteenth Corps; Osterhaus's Division, Fifteenth Corps; and Geary's Division, Twelfth Corps.	65	367	.....	50	200	230	Official Report of Major General U. S. Grant.
Nov. 27th..	Cleveland, Tennessee.....	2d Brigade, 2d Cavalry Division, commanded by Col. Eli Long.	.....	.....	.....	.....	.....	200	Official Report of Major General U. S. Grant.
Nov. 27th to 29th.	Fort Esperanza, Texas.....	8th and 18th Indiana, 33d and 99th Illinois, 23d and 34th Iowa, and 13th and 15th Maine Volunteers, 7th Michigan and Co. F, 1st Missouri Battery,—portion of the 1st and 2d Divisions, Thirteenth Corps	1	2	.....	1	.....	6	Official Report of Major General C. C. Washburne, commanding.
Nov. 28th..	Louisville, Tennessee.....	6th Illinois Cavalry.....	.....	.....	.....	.....	.....	.....	
Nov. 29th..	Fort Sanders, Knoxville, Tennessee....	Army of the Ohio Major General A. E. Burnside.....	20	80	.....	80	400	300	See Siege of Knoxville, Nov. 17th.
Nov. 30th..	Salyersville, Kentucky.....	14th Kentucky Volunteers.....	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Kentucky, Vol. I, page 892.
Dec. 1st...	Ripley, Mississippi	2d Brigade, Cavalry Division, Army of the Tennessee, commanded by Colonel Hatch, 2d Iowa Cavalry.	.....	.....	.....	.....	.....	.....	
Dec. 2d....	Walker's Ford, Clinch River, West Virginia.	5th Indiana and 14th Illinois Cavalry, 21st Ohio Battery, and 65th, 116th, and 118th Indiana Volunteers.	9	39	21	25	50	28	Official.
Dec. 3d...	Salisbury, Tennessee	2d Brigade, Cavalry Division, Sixteenth Corps, commanded by Colonel E. Hatch, 2d Iowa Cavalry.	.....	.....	.....	.....	.....	.....	
Dec. 4th...	Niobrara, Nebraska.....	One company of the 7th Iowa Cavalry.....	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1865, p. 144.
Dec. 4th...	Moseow Station, Mississippi	Cavalry Division, Sixteenth Corps, commanded by Brigadier General B. H. Grierson.	.....	175†	40	15	40	.....	Also designated Wolf River Bridge. Official dispatches of Gen. S. D. Lee, C. S. A. Colonel E. Hatch, U. S. V., wounded.
Dec. 6th...	Clinch Mountain, Tennessee	Cavalry of the Army of the Ohio.....	.....	.....	.....	.....	.....	.....	
Dec. 7th...	Natchez, Mississippi	One company of the 4th Iowa Cavalry.....	.....	.....	.....	.....	.....	.....	
Dec. 7th...	Creelsboro', Kentucky	13th Kentucky Cavalry	.....	.....	.....	10	.....	10	Report of Adjutant General of Kentucky, Vol. I, page 373.
Dec. 7th...	Celina, Tennessee	13th Kentucky Cavalry	.....	.....	.....	5	.....	13	Report of Adjutant General of Kentucky, Vol. I, page 373.
Dec. 8th...	Princeton, Arkansas	Detachment of Cavalry	.....	.....	.....	8	18	28	Report of Adjutant General of Iowa, 1867, Vol. II, page 511.
Dec. 8th to 21st.	Averill's raid, Southwestern Virginia....	2d, 3d, 4th, and 8th West Virginia Mounted Infantry, 14th Pennsylvania and Dodson's Battalion Cavalry, and Battery G, West Virginia Artillery.	6	5	94	.....	.....	200	Official Report of Brig. General W. W. Averill, commanding.
Dec. 10th..	Bean's Station, Tennessee.....	Bond's Brigade of Wolford's Division of Shackleford's Cavalry Corps, Army of the Ohio.	.....	.....	.....	.....	.....	150	
Dec. 10th..	Morristown, Tennessee.....	Garrard's Brigade of Foster's Division, Shackleford's Cavalry Corps, Army of the Ohio.	.....	.....	.....	12	20	.....	
Dec. 10th..	Moresburg, Tennessee	Cavalry, Army of the Ohio	.....	.....	.....	.....	.....	.....	
Dec. 12th..	Duval's Bluff, Arkansas.....	8th Missouri Cavalry.....	.....	2	.....	.....	.....	.....	Official.

Dec. 12th..	Big Sewell and Meadow Bluff, West Virginia.	12th Ohio Volunteers, of General Scammon's command.	2	10	.....	.....	.....	.....	Casualty List, S. G. O.
Dec. 14th..	Bean's Station, Tennessee.....	Cavalry Division of the Army of the Ohio, commanded by Major General Shackleford.	.....	700†	.....	.....	900†	.....	General Gracie, C. S. A., wounded.
Dec. 15th..	Sangster's Station, Virginia	150th New York Volunteers	.....	1	4	.....	.....	.....	
Dec. 16th..	Blain's Cross Roads, Tennessee.....	Army of the Ohio.....	.....	.....	.....	.....	.....	.....	
Dec. 17th and 24th.	Rodney, Mississippi.....	1st Mississippi Marine Brigade, cavalry and infantry ...	2	.....	1	.....	.....	.....	Official.
Dec. 18th..	Indiantown, North Carolina	36th U. S. Colored Troops (2d North Carolina) and 5th U. S. Colored Troops, commanded by Brigadier General Wild.	9	7	.....	2	11	.....	Official. Also designated Sandy Swamp.
Dec. 19th..	Barren Fork, Indian Territory.....	1st and 3d Kansas Indian Home Guards, commanded by Colonel W. A. Phillips.	.....	.....	.....	50	.....	.....	
Dec. 22d..	Cleveland, Tennessee.....	.....	1	.....	6	.....	.....	.....	Confederate sources.
Dec. 23d..	Jacksonport, Arkansas	3d Missouri Cavalry.....	.....	.....	.....	.....	.....	.....	Official.
Dec. 24th and 25th.	Bolivar and Summerville, Tennessee...	7th Illinois Cavalry, commanded by Colonel Prince....	3	8	29	.....	.....	.....	Casualty return, S. G. O.
Dec. 25th..	Lafayette, Tennessee	117th Illinois Volunteers.....	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Illinois, Vol. II, page 537.
Dec. 25th..	Legaresville, Stono Inlet, South Carolina.	U. S. gunboat Marblehead.....	3	3	.....	.....	.....	.....	
Dec. 26th..	Port Gibson, Mississippi.....	Mississippi Marine Brigade of Infantry and Cavalry ...	.....	.....	.....	.....	.....	.....	Official.
Dec. 27th and 28th.	Colliersville, Tennessee.....	Cavalry of the Army of the Tennessee.....	.....	.....	.....	.....	.....	.....	
Dec. 28th..	Charleston, Tennessee	Detachments of infantry and cavalry, commanded by Colonel Laibold, 2d Missouri Volunteers, and Loug's 4th Ohio Cavalry, guarding a wagon train.	2	15	1	8	39	121	Official Report of Major General Thomas.
Dec. 29th..	Talbot's Station and Mossy Creek, Tennessee.	1st Brigade, 2d Division, Twenty-third Corps, 1st Tennessee, 1st Wisconsin, and 2d and 4th Indiana Cavalry, and 24th Indiana Battery, commanded by Brig. General S. D. Sturgis.	.....	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 6.
Dec. 29th and 30th	Matagorda Bay, Texas.....	Three companies of the 13th Maine, assisted by the gunboat Sciota.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Maine, 1863, p. 80.
Dec. 30th..	St. Augustine, Florida.....	10th Connecticut and 24th Massachusetts Volunteers. ..	4	.....	25	.....	.....	.....	Reports of Adjutant Generals of Massachusetts and Connecticut.
Dec. 30th..	Greenville, North Carolina	Detachment of the 12th New York, 23d New York Battery, and 1st North Carolina Volunteers, commanded by Colonel McChesney.	1	6	1	6	.....	10	Official.
Dec. 30th..	Waldron, Arkansas	2d Kansas Cavalry.....	2	6	.....	.....	.....	.....	Official.
1864. Jan. 1st..	Rectortown, Virginia.....	1st Maryland Cavalry, Potomac Home Brigade, commanded by Major H. A. Cole.	.....	10†	41	.....	.....	.....	Partizan Life with Mosby, page 178. Also designated Five Points.
Jan. 3d....	Jonesville, Virginia.....	Detachment of the 16th Illinois Cavalry and 22d Ohio Battery, commanded by Major Beers, 16th Illinois Cavalry.	12	48	300	4	12	.....	Ohio in the War, Vol. 2, page 883.
Jan. 4th...	Fort Sumner, New Mexico	Co. B, 2d California, and Apaches and citizens	.....	.....	.....	40	25	.....	Fight with the Navajo Indians.
Jan. 7th...	Martin's Creek, Arkansas	11th Missouri Cavalry.....	1	1	13	.....	.....	.....	Official.

† Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Jan. 7th...	Madisonville, Louisiana								
Jan. 8th...	Petersburgh, West Virginia								
Jan. 9th...	Turman's Ferry, Kentucky	39th Kentucky Volunteers							Official.
Jan. 10th..	Loudon Heights, Virginia	1st Maryland Potomac Home Brigade Cavalry, commanded by Major H. A. Cole.	2	17		4	10	3	Official Report of Brigadier General J. C. Sullivan. Partizan Life with Mosby, page 180.
Jan. 10th..	Strawberry Plains, Tennessee	Cavalry							
Jan. 12th..	Mayfield, Kentucky	58th Illinois Volunteers	1	1	14	2			
Jan. 13th..	Mossy Creek, Tennessee	Cavalry, commanded by Colonel McCook				14		41	
Jan. 14th..	Middleton, Tennessee	35th Iowa Volunteers			4				
Jan. 14th..	Bealton, Virginia	One company of the 9th Massachusetts Volunteers		2		3	12		Report of Adjutant General of Massachusetts, 1864. page 295.
Jan. 14th..	Terrisville, Cosby Creek, Tennessee	Detachments of the 15th Pennsylvania and 10th Ohio Cavalry, commanded by Colonel W. J. Palmer, 15th Pennsylvania Cavalry.						100	Ohio in the War, Vol. 2, page 816.
Jan. 16th to 18th.	Grand Gulf, Mississippi	Cavalry and infantry of the Mississippi Marine Brigade.		3	2				Official.
Jan. 16th and 17th.	Dandridge, Tennessee	Cavalry Division, Army of the Ohio, commanded by Brigadier General Sturgis, and infantry of the Fourth Corps.		150					
Jan. 17th..	Lewisburgh, Arkansas	Detachment of the 2d Arkansas Cavalry, commanded by Captain D. Hamilton.	2		4	6	6		
Jan. 19th..	Branchville, near Pine Bluff, Arkansas.	5th Kansas Cavalry, commanded by Colonel Powell Clayton.			8				Casualty List, File F, No. 234, S. G. O. Also designated Ivy Ford.
Jan. 20th..	Island No. 76, Mississippi	Battery E, 2d Colored Light Artillery			3				Official.
Jan. 20th..	Tracy City, Tennessee	Detachment of the 20th Connecticut Volunteers	2						Official Report of Major General G. H. Thomas.
Jan. 21st..	Near Dalton, Georgia	28th Kentucky Mounted Infantry and 4th Michigan Cavalry, commanded by Colonel W. P. Boone.							Official Report of Major General G. H. Thomas.
Jan. 22d..	Armstrong Ferry, Tennessee								
Jan. 23d..	Rolling Prairie, Arkansas	11th Missouri Cavalry	11						Official.
Jan. 24th..	Baker Springs, Caddo Gap, Arkansas...	2d and 6th Kansas Cavalry	1	2	1	6	2	27	Official.
Jan. 24th..	Tazewell, Tennessee	34th Kentucky and 116th and 118th Indiana Volunteers, 11th Tennessee Cavalry, and 11th Michigan Battery.				31			Report of Adjutant General of Kentucky, Vol. II, page 345.
Jan. 25th..	Athens, Alabama			20			30		Official reports.
Jan. 26th..	Florence, Alabama	Troops commanded by Colonel A. O. Miller, 72d Indiana Volunteers.		10		15	30	30	Official Report of Major General G. H. Thomas.
Jan. 27th..	Cameron, Virginia	Train on the Orange and Alexandria Railroad		15					

Jan. 27th..	Fair Gardens, near Seviersville, Tennessee.	Cavalry division, Army of the Ohio, commanded by Brigadier General S. D. Sturgis.	.....	100†	.....	65	.....	100	Official. Also designated French Broad and Kelly's Ford.
Jan. 27th..	Scott's Mills Road, near Knoxville, Tennessee.	13th Kentucky and 23d Michigan Volunteers.....	1	.....	12	.....	.....	.....	Report of Adjutant General of Michigan, 1864, page 181.
Jan. 28th..	Tunnel Hill, Georgia	Reconnoisance of part of the Fourteenth Corps, Army of the Cumberland.	.....	2	.....	.....	32	.....	Official Report of Major General Geo. H. Thomas.
Jan. 28th..	Oregon Mountains	1st California Cavalry.....	.....	4	.....	.....	.....	.....	
Jan. 29th..	Medley, near Williamsport, West Virginia.	22d Illinois, 2d Maryland Potomac Home Brigade, and 1st and 14th West Virginia Volunteers, and 4th West Virginia and Ringgold's (Pa.) Cavalry.	10	70	.....	.....	100	.....	List of casualties, File A, No. 451, S. G. O. The Nationals, commanded by Colonel J. W. Snyder, were guarding a wagon train.
Jan. 29th..	Cumberland Gap, Tennessee	.....	.....	.....	.....	.....	.....	.....	
Jan. ——	Cañon de Chelly.....	Nationals, commanded by Colonel Kit Carson.....	.....	.....	.....	.....	.....	.....	Engagements with Indians; 23 killed and 150 wounded.
Feb. 1st, 2d and 3d.	Bachelor Creek, Newport Barracks, and New Berne, North Carolina.	132d New York, 9th Vermont, 17th Massachusetts, and 2d North Carolina Volunteers, 12th New York Cavalry, and 3d New York Artillery, commanded by Brigadier General I. W. Palmer.	16	50	280	5	30	.....	Official reports, Union and Confederate. Casualty List, File A, No. 432, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 239.
Feb. 1st...	Smithfield, Virginia.....	Detachments from the 3d Pennsylvania Artillery, 20th New York Cavalry, 99th New York and 21st Connecticut Volunteers, and a detachment of seamen from the U. S. steamer Minnesota, on the gunboat "Smith Briggs."	.....	.....	90	.....	.....	.....	Official reports.
Feb. 1st...	Waldron, Arkansas	2d Kansas Cavalry.....	.....	1	.....	.....	.....	.....	
Feb. 1st...	New Creek Valley, West Virginia.....	One company of infantry.....	2	10	.....	.....	.....	.....	
Feb. 1st to Mar. 8th.	Expedition up the Yazoo, Mississippi....	11th Illinois, 47th U. S. Colored Troops (8th Louisiana), 3d U. S. Colored Cavalry (1st Mississippi), and a portion of Rear-Admiral Porter's fleet.	.....	.....	.....	.....	.....	.....	Casualty List, File A, No. 414, S. G. O. Land forces commanded by Colonel J. H. Coates, 11th Illinois.
Feb. 3d...	Lebanon, Alabama	Detachment from the Army of the Cumberland	.....	.....	.....	.....	.....	.....	Official Report of Major General G. H. Thomas. Ohio in the War, Vol. 2, page 294.
Feb. 3d...	Liverpool Heights, Mississippi.....	11th Illinois Volunteers and 47th U. S. Colored Troops (8th Louisiana).	6	28	1	.....	15	.....	Casualty List, File A, No. 414, S. G. O. See expedition up the Yazoo, February 1st.
Feb. 3d...	Patterson Creek, West Virginia.....	.....	2	10	5	.....	.....	.....	
Feb. 3d...	Springfield, West Virginia	Cavalry, commanded by Lieut. Colonel Thompson.....	.....	.....	.....	.....	.....	.....	
Feb. 3d to Mar. 5th.	Expedition from Vicksburg to Meridian, Mississippi.	Veatch's and A. J. Smith's Divisions of the Sixteenth Corps, Hurlburt's; Leggett's, and Crocker's Divisions of the Seventeenth Corps, McPherson's; with the 5th and 11th Illinois, 4th Iowa, 10th Missouri, and Foster's Ohio Battalion of Cavalry.	21	68	81	.....	400†	200	Official Report of Major General W. T. Sherman, commanding. Casualty List, File A, No. 414, S. G. O.
Feb. 4th...	Rolling Prairie, Missouri.....	8th Missouri Militia Cavalry.....	.....	.....	.....	.....	.....	.....	Official.
Feb. 4th...	Hot Springs, Arkansas.....	3d Missouri Cavalry.....	.....	3	6	.....	.....	.....	Official.
Feb. 4th...	Champion Hills, Baker's Creek, Raymond, and Bolton Depot, Mississippi.	10th Missouri, 4th Iowa, 5th and 11th Illinois, and Foster's Battalion Ohio Cavalry, and a portion of the Seventeenth Corps.	16	40	7	10	30	.....	See expedition to Meridian, Mississippi, Feb. 3d. Also designated Big Black River.
Feb. 4th...	Moorefield, West Virginia.....	Portion of the troops of the Department of West Virginia, commanded by Colonel J. A. Mulligan, 23d Illinois Volunteers.	.....	60†	.....	.....	40†	.....	
Feb. 5th...	Clinton and Jackson, Mississippi.....	Cavalry and a portion of the Seventeenth Corps, Major General Sherman's forces.	7	30	13	10	35	.....	See expedition to Meridian, February 3d.

† Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Feb. 5th...	Qualltown, North Carolina	Detachment of the 14th Illinois Cavalry, commanded by Major Davis.	3	6	.....	.....	.....	50	Official Report of Major General Grant. Also known as Deep Creek. Major General Vance, of the Confederate army, captured.
Feb. 5th...	Cape Girardeau, Missouri	2d Missouri Militia Cavalry	.....	.....	.....	7	.....	8	Official.
Feb. 5th...	Wyatt's, Mississippi	114th Illinois Volunteers	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Illinois, Vol. II, page 516.
Feb. 6th...	Bolivar, Tennessee	Detachment of the 7th Indiana Cavalry	1	3	.....	.....	30	.....	
Feb. 6th...	Morton's Ford, Virginia	Reconnoissance by a part of the Second Corps, Army of the Potomac.	10	201	45	.....	.....	100	Casualty List, S. G. O.
Feb. 7th...	Barnett's Ford, Virginia	1st Division Cavalry, Army of the Potomac, commanded by Brigadier General Merritt.	.....	20†	.....	.....	.....	.....	Casualty Return, S. G. O.
Feb. 7th...	Vidalia, Louisiana	6th U. S. Heavy Artillery (2d Mississippi), 64th U. S. Colored Troops (7th Louisiana), and 30th Missouri Volunteers.	.....	.....	.....	6	10	18	
Feb. 8th...	Morton, Mississippi	Cavalry of Major General Sherman's forces.	.....	.....	.....	.....	.....	.....	Official. See expedition to Meridian, Mississippi, February 3d.
Feb. 8th...	Donaldsonville, Louisiana	4th Wisconsin Cavalry	.....	1	4	.....	.....	.....	Official.
Feb. 9th...	Near Point Washington, Florida	Detachment of the 7th Vermont Volunteers, commanded by Lieutenant Ross.	.....	.....	11	.....	.....	.....	Report of Adjutant General of Vermont, 1864, page 189.
Feb. 9th...	Morgan's Mills, Spring River, White County, Arkansas.	Detachments of the 11th Missouri and 1st Nebraska Cavalry, and 4th Arkansas Infantry.	1	4	23	.....	.....	65*	Official Report of Lieutenant Colonel Stephens, 11th Missouri Cavalry, commanding.
Feb. 9th and 10th.	Barber's Place, South Fork, St. Mary's River, Florida.	40th Massachusetts Mounted Volunteers and Independent Battalion Massachusetts Cavalry, commanded by Colonel Guy V. Henry, 40th Massachusetts Mounted Volunteers.	4	13	.....	2	3	.....	Official Report of Brigadier General Seymour. Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, p. 243.
Feb. 10th to 25th.	Smith's raids from Germantown, Tennessee, co-operating with Sherman's expedition to Meridian.	4th Missouri, 2d New Jersey, 7th Indiana, 19th Pennsylvania, 2d Iowa, 2d, 3d, 6th, 7th, and 9th Illinois, 3d Tennessee, 4th U. S., and 5th Kentucky Cavalry, 72d Indiana Mounted Infantry, and other regiments composing Smith's and Grierson's Cavalry Divisions.	25	109	.....	.....	.....	300	Official Report of Brigadier General W. S. Smith, commanding. Casualty List, S. G. O., File F, page 251.
Feb. 12th..	Rock House, Wayne County, West Virginia.	14th Kentucky Infantry, commanded by Col. Gallup.	.....	.....	.....	12	4	50	
Feb. 12th..	Caddo Gap and Scott's Farm, Arkansas.	2d Kansas Cavalry	.....	3	.....	.....	.....	.....	Official.
Feb. 12th..	Lake City, Florida	40th Massachusetts Volunteers and Independent Battalion Massachusetts Cavalry, commanded by Col. Guy V. Henry.	.....	3	.....	2	5	.....	Casualty List, S. G. O. Official Report of Brig. General F. Seymour, commanding.
Feb. 12th..	Decatur, Mississippi	One regiment of the Sixteenth Corps, guarding a wagon train.	.....	.....	.....	.....	.....	.....	See Sherman's expedition to Meridian, Mississippi, February 3d.
Feb. 12th..	Chunky Station, Mississippi	20th, 29th, 31st, 45th, and 124th Illinois Volunteers, Seventeenth Corps, commanded by General Force.	12	.....	.....	6	12	12	See Sherman's expedition to Meridian, Mississippi, February 3d.
Feb. 13th..	Vicksburg, Mississippi	52d U. S. Colored Troops (2d Mississippi)	.....	3	3	.....	.....	.....	Official.

Feb. 13th..	Tunnel Hill, Mississippi	Cavalry advance of Major General Sherman's forces, commanded by Colonel E. F. Winslow, 4th Iowa Cavalry.	.....	.....	.....	.....	.....	.....	See Sherman's expedition to Meridian, Mississippi, February 3d. Report of Adjutant General of Iowa, 1864, page 966.
Feb. 14th..	Ross Landing, Grand Lake, Arkansas	51st U. S. Colored Troops (1st Mississippi)	13	7	.....	.....	.....	.....	Official.
Feb. 14th..	Meridian, Mississippi	Occupied by Major General Sherman's forces	.....	.....	.....	.....	.....	.....	See Sherman's expedition to Meridian, Mississippi, February 3d.
Feb. 14th..	Gainesville, Florida	40th Massachusetts Volunteers, commanded by Captain G. E. Marshall.	.....	.....	.....	.....	40	.....	Official Report of Brigadier General F. Seymour, commanding.
Feb. 14th..	Brentsville, Virginia	13th Pennsylvania Cavalry, commanded by Major J. H. Larrimer, 5th Pennsylvania Reserves.	4	1	.....	.....	.....	.....	
Feb. 14th and 15th.	Waterproof, Louisiana	49th U. S. Colored Troops (11th Louisiana) and the gunboat Forest Rose.	8	14	.....	15	.....	5	
Feb. 16th..	Lauderdale Springs, Mississippi	32d Wisconsin Volunteers and an Indiana regiment	.....	.....	.....	.....	.....	.....	See Sherman's expedition to Meridian, Mississippi, February 3d.
Feb. 17th..	Marion, Mississippi	Portion of the Seventeenth Corps	.....	.....	.....	.....	.....	.....	See Sherman's expedition to Meridian, Mississippi, February 3d.
Feb. 17th..	Loss of the Housatonic in Charleston Harbor, South Carolina.		5	.....	.....	.....	.....	.....	Official Report of Rear-Admiral J. A. Dahlgren.
Feb. 19th..	Grosse Tete Bayou, Louisiana	4th Wisconsin Cavalry	.....	2	.....	4	6	12	Report of Adjutant General of Wisconsin, 1865, page 635.
Feb. 19th..	Waugh's Farm, near Batesville, Independence County, Arkansas.	11th Missouri Cavalry and 4th Arkansas Infantry, commanded by Captain Wm. Castle, 11th Missouri Cavalry.	3	4	40	6	10	.....	Official.
Feb. 20th..	Holston River, Tennessee	4th Tennessee Volunteers	2	3	.....	5	10	15	Report of Adjutant General of Tennessee, 1865, page 98.
Feb. 20th..	Olustee, Florida	47th, 48th, and 115th New York, 7th Connecticut, 7th New Hampshire, and 40th Massachusetts Volunteers, 1st Massachusetts Cavalry, 54th Massachusetts Colored Troops, 1st North Carolina Colored Troops, 8th U. S. Colored Troops, 1st and 3d U. S. Artillery, and 3d Rhode Island Artillery.	193	1,175	460	100	400	.....	Appendix to Part I, Medical and Surgical History of the War, page 243. Casualty List, S. G. O. Official Report of Brigadier General F. Seymour, commanding. Also designated Ocean Pond and Silver Lake.
Feb. 20th..	Prairie Station, Mississippi		10	26	.....	.....	.....	.....	See Smith's raid in Mississippi, February 10th.
Feb. 21st..	West Point, Mississippi		8	32	.....	.....	.....	.....	See Smith's raid in Mississippi, February 10th.
Feb. 22d..	Powell's River Bridge, Tennessee	Two companies of the 34th Kentucky Infantry.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Kentucky, Vol. II, page 345.
Feb. 22d..	Cumberland Gap, Tennessee	One company of the 91st Indiana Volunteers	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Indiana, Vol. III, page 117.
Feb. 22d..	Mulberry Gap, Tennessee	9th Tennessee Cavalry	.....	13†	256	.....	.....	.....	Confederate statements. Also known as Wyerman's Mills.
Feb. 22d..	Okalona and Mount Ivy, Mississippi	Brigadier Generals W. S. Smith's and B. F. Grierson's Cavalry Divisions.	.....	100	.....	.....	50	.....	Smith's raid in Mississippi, February 1st, 1864. Also designated Ivy Hills.
Feb. 22d..	Drainesville, Virginia	Detachment of the 2d Massachusetts Cavalry, commanded by Captain J. S. Reed.	10	7	57	2	4	.....	Report of Adjutant General of Massachusetts, 1864, page 946. Partizan Life with Mosby, page 203.
Feb. 22d..	Luna Landing, Arkansas	1st Mississippi Marine Brigade (Missouri Volunteers)	.....	5	.....	.....	.....	.....	Official.
Feb. 22d..	Willmarsh Island, South Carolina	85th Pennsylvania and 4th New Hampshire Volunteers	.....	4	.....	.....	.....	20	
Feb. 22d..	Johnson's Mills, White County, Tenn.	Detachment o the 5th Tennessee Cavalry	23	1	.....	.....	.....	.....	Report of Adjutant General of Tennessee, 1866, p. 442. Prisoners killed by Champ Ferguson's guerillas.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Feb. 23d..	Calf Killer Creek, Tennessee.....	5th Tennessee Cavalry.....	8	3	.....	25	.....	.....	Report of Adjutant General of Tennessee, 1865, page 442.
Feb. 27th and 28th.	Near Canton, Mississippi.....	Foraging detachments, one of the 3d Iowa and another of the 32d Iowa Volunteers.	2	6	20	3	15	.....	Report of Adjutant General of Iowa, 1864.
Feb. 25th to 27th.	Buzzard Roost and Tunnel Hill, Rocky Face Ridge, Georgia.	Fourth and Fourteenth Corps and Cavalry Corps, Army of the Cumberland.	17	272	.....	20	120	.....	Casualty List, S. G. O. Official Report of Major General G. H. Thomas, commanding. Appendix to Part I, Medical and Surgical History of the War, page, 297.
Feb. 28th to Mar. 4th.	Kilpatrick's raid from Stevensburg to Richmond, Virginia.	Division of cavalry, Army of the Potomac.....	.....	.....	300*	.....	.....	300*	Casualty List. S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 79.
Feb. 28th..	Dukedom, Kentucky.....	7th Tennessee Cavalry.....	.....	.....	.....	.....	.....	.....	
Feb. 28th..	Near Yazoo City, Mississippi	3d U. S. Colored Cavalry (1st Mississippi).....	8	4	10	.....	.....	.....	Official. See expedition up the Yazoo, Feb. 1st.
Feb. 29th..	New Berne, North Carolina	.....	.....	.....	.....	.....	.....	.....	
Feb 29th..	Taylorsville, South Anna River, Va.....	6th New York Cavalry	.....	.....	.....	.....	.....	.....	See Kilpatrick's raid, February 28th.
Mar. 1st...	Stanardsville and Burton's Ford, Rapidan, Virginia.	1st. 2d, 5th, and 6th U. S., 6th Pennsylvania, 1st New York, and 1st New Jersey Cavalry, commanded by Brigadier General Custer.	.....	10	.....	.....	.....	30	Casualty List, S. G. O.
Mar. 1st...	Brooks' Turnpike, Richmond fortifications, Virginia.	Cavalry of the Army of the Potomac.....	.....	.....	.....	1	7	.....	See Kilpatrick's raid, February 28th, 1864.
Mar. 1st...	Atlees, Bidnella Cross Roads, Virginia..	Cavalry of the Army of the Potomac	.....	.....	.....	.....	.....	.....	See Kilpatrick's raid, February 28th, 1864.
Mar. 2d...	Near Walkertown, Virginia	2d New York Cavalry, commanded by Colonel Ulric Dahlgren.	.....	.....	.....	.....	.....	.....	See Kilpatrick's raid, February 28th, 1864. Col. Dahlgren killed.
Mar. 2d...	Harrisonburg, Louisiana.....	Mississippi squadron, commanded by Rear-Admiral Porter.	2	14	.....	.....	.....	.....	Official.
Mar. 3d...	Tunstall Station, Virginia.....	7th Michigan and 1st Vermont Cavalry.....	.....	.....	30	.....	.....	.....	See Kilpatrick's raid, February 28th, 1864.
Mar. 4th...	Rodney, Mississippi.....	Cavalry and infantry of the Mississippi Marine Brigade.	2	3	5	.....	.....	.....	Official.
Mar. 5th...	Panther Springs, Tennessee	One company of the 3d Tennessee	2	8	22	.....	30	.....	
Mar. 5th...	Yazoo City, Mississippi.....	3d U. S. Colored Cavalry (1st Mississippi), 47th U. S. Colored Troops (8th Louisiana), and the 11th Illinois Volunteers, commanded by Colonel J. H. Coates, 9th Illinois Volunteers.	21	89	21	35	75	25	Casualty List, File A, No. 414, S. G. O. See expedition up the Yazoo.
Mar. 5th...	Coleman's, Mississippi.....	Mississippi Marine Brigade.....	.....	.....	.....	.....	.....	.....	Official.
Mar. 6th...	Flint Creek, Arkansas.....	14th Kansas Cavalry.....	.....	.....	.....	.....	.....	.....	Official.
Mar. 7th...	Decatur, Alabama	Troops of the Army of the Tennessee, commanded by Brigadier General Dodge.	.....	.....	.....	.....	.....	.....	
Mar. 9th...	Suffolk, Virginia.....	2d U. S. Colored Cavalry, commanded by Colonel G. W. Cole.	8	1	1	.....	25	.....	Official.
Mar. 10th..	Cabletown, Virginia.....	1st New York Veteran Cavalry.....	3	.....	6	.....	.....	.....	Partizan Life with Mosby, page 206.

Mar. 13th..	Carrolton Store, Virginia	1st New York Mounted Rifles and 11th Pennsylvania Cavalry.	.....	.....	.....	.....	20	70	Unofficial.
Mar. 14th..	Cheek's Cross Roads, Tennessee	Cavalry, commanded by Colonel Israel Garrard, 7th Ohio Cavalry.	.....	.....	.....	.....	.....	.....	
Mar. 14th..	Fort De Russy, Louisiana	Detachments of the Sixteenth and Seventeenth Army Corps, commanded by Brig. General A. J. Smith, and Mississippi squadron, commanded by Rear-Admiral Porter.	7	41	.....	5	4	200	Official. Casualty List, File A, No. 425, S. G. O
Mar. 15th..	Clarendon, Arkansas	8th Missouri Cavalry	1	3	.....	.....	.....	.....	Official.
Mar. 16th..	Fort Pillow, Tennessee	.....	.....	.....	.....	.....	50	.....	
Mar. 17th..	Manchester, Tennessee	5th Tennessee Cavalry, commanded by Colonel W. B. Stokes.	.....	.....	.....	21	.....	.....	
Mar. 18th..	Monticello, Arkansas	7th Missouri Cavalry	.....	.....	2	.....	.....	.....	Official.
Mar. 18th..	Calf Killer River, Tennessee	5th Tennessee Cavalry, commanded by Colonel W. B. Stokes.	.....	.....	.....	8	.....	.....	Report of Adjutant General of Tennessee, 1866, page 442.
Mar. 20th..	Bersheba Springs, Tennessee	5th Tennessee Cavalry, commanded by Captains Blackburn and Waters.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Tennessee, 1865, page 442.
Mar. 21st..	Henderson Hills, Louisiana	Detachment of the 16th Corps and Cavalry of the 19th Corps, commanded by Brigadier General Mower.	.....	1	.....	8	.....	250	Casualty List, S. G. O. Official Report of Major General N. P. Banks, commanding Red River expedition. Also designated Bayou Rapides.
Mar. 24th..	Union City, Kentucky	7th Tennessee Cavalry, commanded by Lieutenant Colonel J. R. Hawkins.	.....	1	450	.....	.....	.....	Official Report of N. B. Forrest, commanding Confederates. Post captured.
Mar. 25th.	Fort Anderson, Paducah, Kentucky	16th Kentucky Cavalry, 122d Illinois Infantry, and 8th U. S. Colored Heavy Artillery (1st Kentucky), commanded by Colonel S. G. Hicks, 40th Illinois.	14	46	30	10	40	.....	Official Report of N. B. Forrest, commanding. Brigadier General A. P. Thompson, C. S. A., was killed.
Mar. 26th..	Longview, Arkansas	5th Kansas and 7th Missouri Cavalry, and 28th Wisconsin Volunteers, commanded by Col. Powell Clayton.	1	3	1	2	15	20	Official.
Mar. 28th..	Danville, Arkansas	2d Kansas Cavalry	.....	.....	.....	.....	.....	.....	Official.
Mar. 28th..	Arkadelphia, Arkansas	Advance cavalry, Seventh Corps, Major General Fred. Steele, commanding.	.....	.....	3*	.....	3†	15	
Mar. 28th..	Charleston, Illinois	Portion of the 54th Illinois Volunteers, commanded by Colonel G. M. Mitchell.	2	8	.....	3	4	12	Report of Adjutant General of Illinois, Vol. II, page 76. The regiment, while re assembling from veteran furlough, was attacked by a mob of Copperheads.
Mar. 29th..	Bolivar, Tennessee	6th Tennessee Cavalry	8	35	30	.....	.....	.....	Report of Adjutant General of Tennessee, 1866, page 475. Casualty Return, S. G. O.
Mar. 30th..	Mount Elba, Arkansas	7th Missouri and 5th Kansas Cavalry, and 28th Wisconsin Volunteers, commanded by Col. Powell Clayton.	3	15	.....	10	20	300	Report of Adjutant General of Wisconsin, 1865, page 429.
Mar. 30th..	Grosse Tete Bayou, Louisiana	Detachment of the 118th Illinois Volunteers	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Illinois, Vol. II, page 545.
Mar. 31st..	Natchitoches, Louisiana	Cavalry of the 19th Corps, commanded by Brigadier General A. L. Lee.	.....	.....	.....	6	.....	25	Official Report of Major General N. P. Banks, commanding Red River expedition.
Mar. 31st..	Roach's Plantation, near Snydersville, Mississippi.	3d U. S. Colored Cavalry (1st Mississippi)	16	3	1	3	7	.....	Official Also designated Brook's Plantation. Casualty Return, S. G. O.
April 1st..	Near the Rappahannock, Virginia	Patrol of the 1st Connecticut Cavalry	.....	4	2	.....	.....	.....	Report of Adjutant General of Connecticut, 1864, page 409.
April 1st..	Fitzhugh's Woods, Augusta, Arkansas	3d Minnesota Volunteers and 8th Missouri Cavalry	8	16	5	15	45	13	Official Report of Colonel C. C. Andrews, 3d Minnesota Volunteers, commanding.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
April 2d..	Antoine, Arkansas	13th Illinois and 1st Iowa Cavalry	.....	.....	.....	.....	.....	.....	Engagement during Steele's expedition co-operating with Banks.
April 2d..	Spoonville, Terre Noire Creek, Arkansas.	29th Iowa, 50th Indiana, and 9th Wisconsin Volunteers, and 1st Missouri Cavalry, commanded by Brigadier General Rice.	10	35	.....	.....	100†	.....	Engagement during Steele's expedition co-operating with General Banks' Red River expedition. Casualty List, S. G. O.
April 2d..	Crump's Hill, Louisiana	14th New York, 2d Louisiana, 2d Illinois, and 16th Missouri Cavalry, and 5th U. S. Colored Artillery, commanded by Brigadier General A. L. Lee.	5	20	.....	10	25	60	Official report of Major General Banks, commanding Red River expedition. Also designated Piney Woods.
April 2d..	Cleveland, Tennessee	1st Wisconsin Cavalry	.....	.....	12	.....	.....	.....	Official.
April 2d..	Pensacola, Florida	One company of the 14th New York Cavalry, commanded by Captain Sehmidt.	.....	3	.....	.....	10	11	
April 3d..	Okalona, Arkansas	1st Missouri and 13th Illinois Cavalry, and 27th Wisconsin, 40th Iowa, 77th Ohio, and 43d Illinois Volunteers, of the 1st and 3d Divisions. Seventh Corps, commanded by Colonel A. Engleman, 43d Illinois.	16	74	.....	.....	.....	75*	Engagement during Steele's expedition co-operating with General Banks' Red River expedition. Casualty List, S. G. O.
April 4th..	Campti, Louisiana	2d and 18th New York and 3d Rhode Island Cavalry, 35th Iowa and 5th Minnesota Volunteers, commanded by Col. O. P. Gooding, 6th Massachusetts Cavalry.	10	18	.....	3	12	.....	Official Report of Major General N. P. Banks, commanding Red River expedition.
April 4th to 6th.	Elkin's Ford, Little Missouri River, Arkansas.	43d Indiana, 29th and 36th Iowa Volunteers, Battery E, 2d Missouri Light Artillery, and 1st Iowa Cavalry,—2d Brigade, 3d Division, Seventh Corps.	5	33	.....	18	30	6	Engagement during Steele's campaign in Arkansas. Official Report of Colonel W. E. McLean, 43d Indiana, commanding.
April 5th..	Roseville, Arkansas	Seventy-five men of the 2d and 6th Kansas Cavalry	19	11	.....	15	25	11	Official. Engagement with guerrillas.
April 5th..	Stone's Farm, Arkansas	Twenty-six men of the 6th Kansas Cavalry, commanded by Lieutenant McKibben.	11	.....	.....	.....	.....	.....	Official. Eleven of the detachment, including Assistant Surgeon S. A. Fairchilds, were taken prisoners and killed by guerrillas.
April 6th..	Quicksand Creek, Kentucky	Co. I, 14th Kentucky Volunteers, commanded by Capt. Reuben Patrick.	.....	.....	.....	10	7	3	Unofficial.
April 7th..	Wilson's Farm, Louisiana	Advance Cavalry of Nineteenth Corps, commanded by Brigadier General A. L. Lee.	14	39	9	15	40	100	Casualty List, S. G. O. Official Report of Major General N. P. Banks, commanding Red River expedition.
April 7th..	Harney Lake Valley, Oregon	1st Oregon Cavalry	.....	.....	3	.....	.....	.....	Official.
April 7th..	Plains' Store, near Port Hudson, Louisiana.	Detachment of 118th Illinois and 21st New York Battery, and 3d Illinois Cavalry.	1	4	6	.....	.....	2	Report of Adjutant General of Illinois, Vol. II, page 545
April 8th..	Pembescott Bayou, near Osceola, Arkansas.	Battery I, 2d Missouri Light Artillery	4	7	.....	.....	.....	.....	Official.
April 8th..	Wolf River, Tennessee	Cavalry commanded by Brig. Gen. B. H. Grierson	.....	8	.....	.....	.....	2	
April 8th..	Sabine Cross Roads, Louisiana	Cavalry Division, commanded by Brigadier General A. L. Lee: 3d and 4th Divisions, Thirteenth Corps, commanded by Brigadier General Ransom; 1st Division, Nineteenth Corps, commanded by Brigadier General W. H. Emory,—Army of the Department of the Gulf, Major General N. P. Banks, commanding.	200	900	1,800	300	1,200	.....	Casualty List, File A, No. 279, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 335. Also designated Mansfield and Pleasant Grove. Among the casualties in the Confederate army were Major Gen. A. Mouton and Brigadier General M. M. Parsons, killed. In the Union army, Major General Franklin and Brigadier General Ransom were wounded.

April 9th..	Pleasant Hills, Louisiana.....	Cavalry Division, commanded by Brigadier General A. L. Lee; 1st and 3d Divisions, Sixteenth Corps, commanded by Brigadier General A. J. Smith; and 1st Division, Nineteenth Corps, commanded by Major General Franklin.	100	700	300	300	1,200	500	Casualty List, File A, No. 279, S. G. O. Official Report of Major General N. P. Banks, commanding Army of the Red River expedition. Appendix to Part I, Medical and Surgical History of the War, page 335.
April 10th to 13th.	Prairie D'Ann, Arkansas	1st Arkansas, 18th, 29th, 33d, 36th, and 40th Iowa, 50th Indiana, 43d Illinois, 27th Wisconsin, and 12th Kansas Volunteers; 2d and 3d Missouri, 13th Illinois, 2d, 6th, and 14th Kansas, and 1st Iowa Cavalry, and Battery A, 3d Illinois and 2d Indiana Artillery,—3d Division, Seventh Corps.	.....	.....	100*	.....	.....	50*	Report of Adjutant General of Iowa, 1864, p. 1261. Official reports. Casualty List, S. G. O. An engagement during Steele's campaign in Arkansas, co-operating with Banks' Red River expedition.
April 10th.	Little Cacapon, Virginia.....	Co. K, 54th Pennsylvania Volunteers.....	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O.
April 12th	Fort Pillow, Tennessee	11th U. S. Colored Troops (also designated 6th U. S. Colored Heavy Artillery and 1st Alabama), Battery F, 2d U. S. Colored Light Artillery, and Bradford's Battalion of 13th Tennessee Cavalry,—about 600 men.	350	60	164	20	60	.....	Official Report of the U. S. Senate investigating committee. Official Report of Major General N. B. Forrest, commanding Confederates.
April 12th.	Fremont's Orchard, near Denver, Colorado Territory.	Two companies of the 1st Colorado Cavalry.....	2	4	.....	.....	.....	.....	Official.
April 12th.	Pleasant Hill Landing, Louisiana.....	Ironclads Osage and Lexington, of the Mississippi squadron, Rear-Admiral Porter commanding, and troops of the Seventeenth Corps on transports, T. Kilby Smith, commanding.	.....	7	.....	.....	200†	.....	Official Report of Major General N. P. Banks, commanding Red River expedition. Also designated Blair's Landing. The Confederate Gen. Thomas Green was killed.
April 13th.	Indian Bay, Arkansas.....	56th U. S. Colored Troops (3d Arkansas).....	.....	.....	.....	.....	.....	.....	Official.
April 13th.	Florence, Alabama.....	Detachment of the 9th Ohio Cavalry.....	2	.....	41	.....	.....	.....	Ohio in the War, Vol. 2, page 811.
April 13th.	Cleveland, Tennessee	1st Wisconsin Cavalry	.....	.....	20	.....	.....	.....	Official.
April 13th.	Moscow, Arkansas	18th Iowa Volunteers, 2d Indiana Battery, and 6th Kansas Cavalry,—rear-guard of the 3d Division of the Seventh Corps.	5	17	.....	.....	.....	30*	Casualty List, S. G. O. Engagement during Steele's campaign in Arkansas.
April 13th.	Paintsville, Kentucky.....	Kentucky Volunteers, commanded by Colonel G. W. Gallup, 14th Kentucky.	.....	.....	.....	.....	25	50	Report of Adjutant General of Kentucky, Vol. II, page 425.
April 14th	Smithfield, Virginia.....	9th New Jersey, 23d and 25th Massachusetts, and 118th New York Volunteers.	.....	5	1	.....	6	6	Report of Adjutant General of Massachusetts, 1864, page 646. Also designated Cherry Grove.
April 14th.	Half Mount, Magoffin County Kentucky.	Kentucky Volunteers, commanded by Colonel G. W. Gallup, 14th Kentucky.	.....	4	.....	25	.....	6	Report of Adjutant General of Kentucky, Vol. II, page 425.
April 14th.	Dutch Mills, Arkansas	6th Kansas Cavalry.....	.....	.....	9	.....	.....	.....	Skirmish during Steele's campaign in Arkansas.
April 15th.	Bristoe Station, Virginia.....	13th Pennsylvania Cavalry.....	1	2	.....	.....	.....	.....	
April 15th.	Liberty Post Office, Arkansas.....	29th Iowa, 50th Indiana and 9th Wisconsin Volunteers,—advance of the 3d Division, Seventh Corps.	5	10	.....	.....	.....	.....	Skirmish during Steele's Arkansas campaign. Report of Adjutant General of Iowa, 1864, p. 1189.
April 15th and 16th.	Occupation of Camden, Arkansas.....	Advance of the Seventh Corps.....	.....	.....	250*	.....	.....	.....	Casualty List, S. G. O., File A, 619. General F. Steele's forces, co-operating with Major General Banks' Red River expedition.
April 16th.	King's River, Carroll County, Arkansas.	2d Arkansas Cavalry.....	.....	.....	25*	.....	.....	.....	Report of Adjutant General of Arkansas.
April 16th.	Scullyville, Indian Territory.....	3d Kansas Indian Home Guards.....	2	.....	.....	.....	.....	.....	Official.
April 17th to 20th.	Plymouth, North Carolina.....	85th New York, 103d Pennsylvania, and 16th Connecticut Volunteers, commanded by Brigadier General H. W. Wessells, assisted by the Navy under Lieut. Commander Flusser.	20	80	1,500	.....	.....	500*	Official Report of Major General John J. Peck. Includes the engagements at Forts Gray, Wessels, and Williams. Lieutenant Commander C. W. Flusser, U. S. N., was killed.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
April 17th.	Decatur, Alabama	25th Wisconsin Volunteers	.....	2	.....	.....	.....	.....	Report of Adjutant General of Wisconsin, 1865, page 381.
April 18th	Poison Springs, eight miles from Camden, Arkansas.	Forage train, guarded by the 18th Iowa Volunteers; 79th U. S. Colored Troops (2d Kansas), and 6th Kansas Cavalry, Col. J. M. Williams, commanding.	113	88	68	.....	.....	.....	Official. Engagement during Steele's campaign in Arkansas. Casualty List, S. G. O.
April 18th.	Boyken's Mills, South Carolina	54th Massachusetts U. S. Colored Troops	2	18	1	.....	.....	.....	Official.
April 19th.	Pound Gap, Kentucky	45th Kentucky Volunteers	.....	.....	.....	.....	.....	.....	
April 19th.	Natchitoches, Louisiana	4th Brigade, Cavalry Division, Nineteenth Corps	.....	.....	.....	.....	.....	.....	Engagement during Banks' Red River expedition.
April 20th.	Waterproof, Louisiana	63d U. S. Colored Troops (9th Louisiana)	.....	2	.....	.....	.....	.....	Official.
April 21st	Cotton Plant, Cache River, Arkansas	8th Missouri Cavalry	3	2	6	.....	.....	.....	Official.
April 21st.	Red Bone, Mississippi	2d Wisconsin Cavalry	1	6	.....	.....	.....	.....	Official.
April 22d.	Near Tunica Bend, Red River, La.	Three companies of the 3d Rhode Island Cavalry, on transports.	2	17	.....	.....	.....	.....	Report of Adjutant General of Rhode Island, 1865, page 463.
April 23d..	Swan Lake, Arkansas	5th Kansas Cavalry	1	.....	.....	.....	.....	.....	Official.
April 23d..	Moneti's Bluff, Cane River, Louisiana..	Cavalry Division and 3d Brigade, 1st Division of the Nineteenth Corps, and 3d Division, Thirteenth Corps, commanded by Brigadier General H. W. Birge.	40	160	.....	.....	.....	400*	Casualty List, File A, Nos. 279 and 419, S. G. O. Official Report of Major General N. P. Banks, commanding Red River expedition.
April 23d and 24th.	Cloutersville, Louisiana	Portion of the Thirteenth, Seventeenth, and Nineteenth Corps, commanded by Brig. General T. K. Smith.	.....	150†	.....	.....	.....	.....	Official. Engagement during the Red River expedition. Appendix to Part I, Medical and Surgical History of the War, page 336.
April 23d..	Nickajack Trace, Georgia	Detachment of the 92d Illinois Volunteers, commanded by Captain Scovill.	5	9	22	.....	.....	.....	Report of Adjutant General of Illinois, Vol. II, page 551. "Of the men taken prisoners, 12 were shot down and 6 died of wounds."
April 24th	Jacksonport, Arkansas	1st Nebraska Cavalry	.....	2	.....	.....	.....	.....	Official.
April 26th.	Red River, Louisiana	U. S. gunboats Cricket and Fort Hindman	.....	.....	.....	.....	.....	.....	Official Report of Rear-Admiral Porter.
April 25th and 26th.	Wautauga Bridge, Tennessee	10th Michigan Cavalry of the Twenty-third Corps	3	9	3	.....	.....	.....	Casualty List, S. G. O. Also designated Carter's Station.
April 25th.	Marks' Mills, Arkansas	36th Iowa, 77th Ohio, and 43d Indiana Volunteers; Battery E, 2d Missouri Light Artillery, and 1st Indiana and 7th Missouri Cavalry,—escort to a wagon train.	100	250	100	110	228	40	Official Report of Lieut. Colonel Drake, 36th Iowa, commanding. Engagement during Steele's campaign in Arkansas.
April 26th.	Moro Creek, Arkansas	33d and 40th Iowa Volunteers, and 5th Kansas, 2d and 4th Missouri, and 1st Iowa Cavalry.	5	14	20	.....	.....	.....	Official. Engagement during Steele's campaign in Arkansas.
April 26th.	Alexandria, Louisiana	14th New York and 6th Missouri Cavalry	.....	.....	.....	.....	.....	.....	Casualty List, File A, No. 279, S. G. O. Skirmish during the Red River expedition.
April 28th.	Offett's Knob, Missouri	1st Missouri Militia Cavalry	3	.....	.....	.....	.....	.....	Official.
April 29th.	Princeton, Arkansas	40th Iowa and 43d Illinois Volunteers, 3d Illinois Battery, and 6th Kansas Cavalry.	.....	.....	.....	.....	.....	.....	Official Report of Colonel A. Engelmann, 43d Illinois Volunteers, commanding.
April 29th.	Snia Hills, Missouri	2d Colorado Cavalry	2	1	.....	.....	.....	.....	Official.

April 30th.	Jenkins' Ferry, Saline River, Arkansas.	77th Ohio, 4th, 18th, 29th, 33d, 36th, and 40th Iowa, 1st Arkansas, 12th Kansas, 9th and 27th Wisconsin, and 43d Illinois Volunteers; 79th (1st Kansas) and 83d (2d Kansas) U. S. Colored Troops; Battery A, 3d Illinois and 2d Indiana Battery; and 1st Iowa, 2d, 6th and 14th Kansas, 1st and 2d Missouri, and 13th Illinois Cavalry,—composing 3d Division of the Seventh Corps.	200	955	.....	300	800	.....	Casualty List, S. G. O. Engagement during Steele's campaign in Arkansas, co-operating with Banks' Red River expedition. In this engagement Brigadier General S. A. Rice, U. S. V., was mortally wounded.
May 1st...	Jacksonville, Florida	7th U. S. Colored Troops	1	.....	.....	.....	.....	.....	Official.
May 1st...	Hudnot's Plantation, Louisiana	Cavalry of the Nineteenth Corps	10	20	.....	.....	.....	20	Report of Adjutant General of Massachusetts, 1864, page 749.
May 1st to 4th.	Ashwood Landing, Louisiana	64th U. S. Colored Troops	5	2	.....	.....	.....	.....	Official.
May 1st...	Clinton, Louisiana	.....	.....	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 270.
May 1st to 8th.	Near Alexandria, Louisiana	Portions of the cavalry of the Thirteenth and Nineteenth Corps.	23	67	21	25	100	70	Engagement during the return of Major General Banks' Red River expedition.
May 2d....	Memphis, Tennessee	7th Kansas Cavalry	1	.....	.....	.....	.....	.....	Official.
May 2d....	Governor Moore's Plantation, Louisiana.	Foraging expedition, composed of the 83d Ohio Volunteers and the 3d Rhode Island Cavalry, of Major General Banks' forces.	2	10	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 482. Report of Adjutant General of Rhode Island, 1865, page 463.
May 3d....	Cedar Bluffs, Colorado Territory	One company of the 1st Colorado Cavalry	1	1	.....	.....	.....	.....	Official.
May 3d....	Bolivar, Tennessee	Cavalry, commanded by General S. D. Sturgis	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Missouri, 1864, page 182.
May 3d....	Red Clay, Georgia	1st Division Cavalry, McCook's, Army of the Cumberland.	.....	.....	10*	.....	.....	.....	Official.
May 3d....	Baton Rouge, Louisiana	4th Wisconsin Cavalry	.....	.....	.....	.....	.....	.....	
May 3d....	Transport City Belle, near Snaggy Point, Red River, Louisiana.	120th Ohio Volunteers and 73d U. S. Colored Troops	.....	.....	225	.....	.....	.....	Official Report of Major General N. P. Banks. Ohio in the War, Vol. 2, page 617.
May 3d...	Richland, Arkansas	2d Arkansas Cavalry	20	.....	.....	.....	.....	.....	Report of Adjutant General of Arkansas.
May 4th...	Doubtful Cañon, Arizona Territory	Detachment of the 5th California Volunteers and 1st California Cavalry.	1	6	1	10	20	.....	Official Report of Lieutenant H. H. Stevens, 5th California, commanding.
May 4th to 13th.	Yazoo City expedition, Mississippi	3d U. S. Colored Cavalry, 11th, 72d, and 76th Illinois Volunteers, 5th Illinois Cavalry, and 7th Ohio Battery, Brigadier General McArthur, commanding.	5	20	.....	.....	.....	.....	Casualty Lists, S. G. O. See Benton, May 7th, and Vaughn, May 12th.
May 4th to 12th.	Kautz's cavalry raid from Suffolk to City Point, Virginia.	5th and 11th Pennsylvania, 3d New York, and 1st District of Columbia Cavalry, and 8th New York Battery, Cavalry Division, Army of the James.	.....	.....	.....	.....	.....	.....	Official reports. See Wall's Bridge, May 5th, Stoney Creek Station, May 7th, Jarrett's Station and White's Bridge, May 9th.
May 5th...	Ram Albemarle, Roanoke River, North Carolina.	U. S. gunboats Ceres, Commodore Hull, Mattabesett, Sassacus, Seymour, Wyalusing, Miami, and Whitehead, commanded by Captain Melancthon Smith.	5	26	.....	.....	.....	57	Official Report of Acting Rear-Admiral S. P. Lee.
May 5th...	Dunn's Bayou, Red River, Louisiana ...	U. S. steamer Covington, gunboat Signal, and transport Warner, with the 56th Ohio Volunteers on board.	35	65	150	.....	.....	.....	Official Report of Major General N. P. Banks.
May 5th...	Wall Bridge, Virginia	Cavalry Division, Army of the James, Brig. General Kautz.	.....	.....	10*	.....	.....	10	See Kautz's cavalry raid, May 4th to 12th.
May 5th...	Craig's Meeting House, Virginia	3d Division Cavalry, Wilson's, Army of the Potomac.	.....	50	.....	.....	.....	.....	Casualty List, S. G. O. Included in the Wilderness, May 5th to 7th.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS. Killed.	Wounded.	Missing.	CONFED. LOSS. Killed.	Wounded.	Missing.	REMARKS AND REFERENCES.
May 5th to 7th.	Wilderness, Virginia	Second Corps, Major General W. S. Hancock; Fifth Corps, Major General G. K. Warren; Sixth Corps, Major General John Sedgwick; Ninth Corps, Major General A. E. Burnside; and Cavalry Corps, Major General P. H. Sheridan.—Army of the Potomac, Major General G. G. Meade.	3,288 2,309	9,278 12,185	6,784 3,893	2,000	6,000	3,400	Official Report of Lieutenant General U. S. Grant. Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, p. 149. Among the casualties in the Union army were Brigadier Generals James S. Wadsworth, Alex. Hays, and A. S. Webb, killed, and Brig. Generals Getty and Carroll, wounded; in the Confederate army, Generals J. M. Jones and Pickett, killed, and Generals Longstreet, Pegram, Stafford, Hunter, and Jennings, wounded.
May 5th to 9th.	Rocky Face Ridge, Georgia	Fourth Corps, Major General O. O. Howard; Fourteenth Corps, Major General J. M. Palmer; Twentieth Corps, Major General J. Hooker,—Army of the Cumberland, Major General G. H. Thomas: Fifteenth Corps, Major General J. A. Logan; Sixteenth Corps, Major General C. C. Dodge,—Army of the Tennessee, Major General J. B. McPherson; and Twenty-third Corps, Army of the Ohio, Major Gen. J. M. Schofield;—Army of the Military Division of the Mississippi, Major General W. T. Sherman.	200	637	.....	.....	.....	600*	Includes the engagements at Tunnel Hill, Mill Creek Gap, Buzzard Roost, Snake Creek Gap, and near Dalton. Official Report of Major Gen. W. T. Sherman, U. S. V., and Lieut. General J. E. Johnston, C. S. A. Casualty List, S. G. O. Appendix to Part I. Medical and Surgical History of the War, page 299.
May 6th...	James River, near City Point, Virginia..	Gunboat Commodore Jones	23	48	.....	.....	.....	.....	Official report.
May 6th...	Princeton, West Virginia	Advance of General Crook's command	.....	.....	.....	.....	.....	.....	
May 7th...	Benton, Mississippi	11th, 72d, and 76th Illinois Volunteers, and 7th Ohio Battery, commanded by General McArthur.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Illinois, Vol. II, pages 210 and 236.
May 6th and 7th.	Richmond and Petersburg Railroad, near Port Walthal and Chester Station, Va.	Portion of the Tenth and Eighteenth Corps. Army of the James, Major General B. F. Butler, commanding.	48	256	70	50	200	.....	Casualty List, S. G. O. Official reports.
May 7th...	Bayon La Mourie, Louisiana	Portion of the Sixteenth Corps	10	31	.....	.....	.....	50*	Engagement during the return of Banks' Red River expedition.
May 7th...	Tunnel Hill, Georgia	Fourth Corps, Major General O. O. Howard, and Cavalry, Army of the Cumberland, Major Gen. Thomas.	.....	.....	.....	.....	.....	.....	See Rocky Face Ridge, May 5th to 9th.
May 7th...	Mill Creek and Dug Gaps, Georgia	Twentieth Corps, Major General Joseph Hooker, Army of the Cumberland, Major General Thomas.	.....	.....	.....	.....	.....	.....	See Rocky Face Ridge, May 5th to 9th.
May 7th...	Stoney Creek Station, Weldon Railroad, Virginia.	5th and 11th Pennsylvania, 3d New York, and 1st District Columbia Cavalry, and 8th New York Battery, commanded by Brigadier General A. V. Kautz.	.....	.....	.....	.....	.....	.....	See Kautz's raid, May 5th to 12th.
May 8th...	Todd's Tavern, Virginia	2d Division, Cavalry Corps, Brigadier General Gregg, Army of the Potomac.	40	150	60	30	150	70	List of casualties, S. G. O. Included in Spottsylvania.
May 8th... to 18th.	Spottsylvania Court-House, Virginia	Second Corps, Major General W. S. Hancock; Fifth Corps, Major General G. K. Warren; Sixth Corps, Major General H. G. Wright; Ninth Corps, Major General A. E. Burnside; and Cavalry Corps, Major General P. H. Sheridan,—Army of the Potomac, Major General G. G. Meade.	2,146 2,031	7,956 11,731	2,577	1,000	5,000	3,000	Appendix to Part I, Medical and Surgical History of the War, page 149. Casualty List, S. G. O. Includes the engagements on the Fredericksburg Road, Laurel Hill, and Ny River. Among the casualties in the Union army were Major Gen. J. Sedgwick, Brigadier Generals J. C. Rice, J. J. Owens, and T. G. Stevenson, killed; Brigadier Generals Robertson, Bartlett, Morris, and Baxter, wounded. Of the Confederates, Generals Daniels and Perrin were killed, Hayes and Walker, wounded, and Major Gen. Ed. Johnson and Brigadier General G. H. Stewart, captured.

May 8th...	Jeffersonville, Virginia	Cavalry of the Army of West Virginia, Brigadier General W. W. Averill, commanding.						Also designated Abb's Valley.
May 8th...	Buzzard Roost Gap, Georgia	Fourth Corps, Major General O. O. Howard, and Cavalry, Army of the Cumberland, Major Gen. Thomas.						See Rocky Face Ridge, May 5th to 9th.
May 8th...	Snake Creek Gap, Georgia	Fifteenth Corps, Major General John A. Logan, Army of the Tennessee, Major General McPherson.						See Rocky Face Ridge, May 5th to 9th.
May 9th...	Dalton, Georgia	Twenty-third Corps, Army of the Ohio, Major General Schofield.						See Rocky Face Ridge, May 5th to 9th.
May 9th to 13th.	Sheridan's cavalry raid, Virginia	1st Division, Merritt's, and 2d Division, Gregg's, Cavalry Corps, Major General Sheridan's, Army of the Potomac.	50	174	200			Official reports. List of casualties, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 179.
May 9th...	Jarrett's Station, Weldon Railroad, Va.	11th Pennsylvania and 8th New York Battery, commanded by Colonel S. B. Spear.					20	40	See Kautz's raid, May 5th to 12th.
May 9th...	White's Bridge, Nottaway Creek, Va.	3d New York and 1st District Columbia Cavalry, and 8th New York Battery, of the Army of the James.							See Kautz's raid, May 5th to 12th.
May 9th...	Varnell's Station, Georgia	1st Division, McCook's, Cavalry of the Army of the Cumberland.	4	25	65				
May 9th...	Childsburg, Virginia	6th Ohio and 1st New Jersey, holding the rear of the cavalry on Sheridan's raid.							Ohio in the War. Casualty List, S. G. O.
May 9th and 10th.	Swift Creek, Virginia	Tenth Corps, Major General Q. A. Gillmore, and Eighteenth Corps. Major General W. F. Smith,—Army of the James, Major General B. F. Butler.	90	400				500	Casualty List, S. G. O. Official reports. Also known as Arrowfield Church.
May 9th and 10th.	Cloyd's Mountain and New River Bridge, Virginia.	12th. 23d, 36th. and 34th Ohio, 9th, 11th, 14th, and 15th West Virginia Volunteers, and 3d and 4th Pennsylvania Reserves, of the Army of West Virginia.	126	585	34		600*	300	Official Report of Brigadier General George Crook, commanding. Casualty List, S. G. O. General A. G. Jenkins, commanding the Confederates, was killed. Appendix to Part I, Medical and Surgical History of the War, page 227.
May 9th and 10th.	Cove Mountain, near Wytheville, Va.	14th Pennsylvania, 1st, 2d, and 3d West Virginia, and 34th Ohio Mounted Volunteers.							Official Report of Brig. General W. W. Averill, commanding. Also designated Grassy Lick.
May 9th..	Beaver Dam Station, North Anna, Va.	1st Division, Merritt's, Cavalry Corps, Major General Sheridan, of the Army of the Potomac.							Casualty List, S. G. O. Engagement during Sheridan's raid, May 9th to 13th.
May 10th..	Ground Squirrel Church and Bridge, South Anna, Virginia.	1st Division, Merritt's, Cavalry Corps, Major General Sheridan, of the Army of the Potomac.							Casualty List, S. G. O. Engagement during Sheridan's raid, May 9th to 13th.
May 10th..	Dardanelle, Arkansas	6th Kansas Cavalry	2	1					Official.
May 11th..	Ashland, Virginia	1st Massachusetts Cavalry of the 2d Division, Gregg's, Cavalry Corps.							Casualty List, S. G. O. Engagement during Sheridan's raid, May 9th to 13th.
May 11th..	Yellow Tavern, near Richmond, Va.	1st Division, Brig. General Merritt, and 3d Division, Brig. General Wilson, Cavalry Corps. Major General Sheridan, Army of the Potomac.						100	Casualty List, S. G. O. Engagement during Sheridan's cavalry raid. Major General J. E. B. Stuart, commanding the Confederate cavalry, was killed, and Major General J. B. Gordon, C. S. A., wounded.
May 12th..	Smith's Station, Indian Territory	1st Nebraska Battalion Cavalry	1	4					Official.
May 12th..	Vaughn, Mississippi	11th, 72d, and 76th Illinois Volunteers							Engagement during Brigadier General McArthur's expedition to Yazoo City.
May 12th to 16th.	Fort Darling, Drury's Bluff, Virginia.	Tenth Corps, Major General Q. A. Gillmore, and Eighteenth Corps, Major General W. F. Smith,—Army of Virginia and North Carolina, Major General B. F. Butler.	422	2,380	210	400	2,000	100	Casualty List, S. G. O. Includes the engagements at Wierbottom Church, Proctor's, and Palmer's Creek.
May 12th to 17th.	Kautz's raid on the Petersburg and Lynchburg Railroad, Virginia.	Cavalry of the Army of the James, Brigadier General A. V. Kautz.	6	28	7				List of casualties, S. G. O

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS. Killed	UNION LOSS. Wounded.	UNION LOSS. Missing.	CONFED. LOSS. Killed.	CONFED. LOSS. Wounded.	CONFED. LOSS. Missing.	REMARKS AND REFERENCES.
May 12th..	Meadow Bridge, Chickahominy River, Virginia.	1st Division, Merritt's, and 3d Division, Wilson's, Cavalry Corps, Army of the Potomac.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O. Engagement during Sheridan's cavalry raid.
May 13th to 16th.	Resaca, Georgia	Fourth Corps, Major General Howard; Fourteenth Corps, Major General Palmer; Twentieth Corps, Major General Hooker; and Cavalry,—Army of the Cumberland, Major General Thomas: Fifteenth Corps, Major General Logan, and Sixteenth Corps, Major General Dodge,—Army of the Tennessee, Major General McPherson: Twenty-third Corps, Army of the Ohio, Major General J. M. Schofield.	600	2,147	.....	300	1,500	1,000	Casualty Lists, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 299. Official Reports of General W. T. Sherman, commanding Union forces, and J. E. Johnston, commanding Confederate forces. Also designated Sugar Valley and Oostenaula. Among the casualties were Major General Kilpatrick, commanding the 3d Cavalry Division, wounded, and Brig. General B. G. Wadkins, C. S. A., killed.
May 13th..	Pulaski, Tennessee.....	111th U. S. Colored Troops (3d Alabama)	2	.....	.....	.....	.....	.....	Official.
May 13th..	Tilton, Tennessee.....	1st Division, McCook's, Cavalry of the Army of the Cumberland.	.....	.....	.....	.....	.....	.....	Included in Resaca, May 13th.
May 13th..	Point Lookout, Virginia.....	Detachment of the 36th U. S. Colored Troops and seamen from the Potomac flotilla.	1	5	.....	11	.....	10	Official Report of Commander F. A. Parker, U.S.N.
May 14th to 16th.	Mansura, Louisiana.....	3d Division, Sixteenth Corps, portion of cavalry division, Nineteenth Corps.	.....	.....	.....	.....	.....	.....	Casualty List, File A, No. 279, S. G. O. Official Report of Major General N. P. Banks, commanding Red River expedition. Also known as Avoyelle's Prairie, Morreausville, and Marksville.
May 14th..	Rood's Hill, Virginia.....	Portion of the Army of West Virginia, commanded by Colonel A. Moore, 28th Ohio.	.....	.....	30*	.....	.....	50*	Official reports.
May 15th..	Mount Pleasant Landing, Louisiana.....	67th U. S. Colored Troops.....	3	5	1	.....	.....	.....	Official.
May 15th..	New Market, Virginia.....	Portion of the Army of West Virginia, under command of Major General F. Sigel.	120	560	240	85	320	.....	Casualty List, File A, Nos. 181 and 326, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 227.
May 15th..	Ley's Ferry, Georgia.....	Portion of the Sixteenth Corps, Army of the Tennessee.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O. Included in Resaca, May 13th to 16th.
May 15th..	Tanner's Bridge, near Rome, Georgia...	2d Division Cavalry, Army of the Cumberland.....	2	16	20	.....	.....	.....	Casualty List, S. G. O. Report of Adjutant General of Michigan, 1864, page 76.
May 16th..	Rome Cross Roads, Georgia	Sixteenth Corps, Major General Dodge, Army of the Tennessee, Major General McPherson.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O.
May 16th..	Ashepoo River, South Carolina	34th U. S. Colored Troops.....	5	.....	.....	.....	.....	.....	Official.
May 16th..	Pond Creek, Pike County, Kentucky....	39th Kentucky Volunteers.....	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Kentucky.
May 16th..	Clear Creek, Missouri.....	Two companies of the 15th Kansas Cavalry	.....	.....	2	.....	.....	.....	Official.
May 16th to 20th.	Fredericksburg Road, Virginia	Tyler's Division, Fifth Corps, Army of the Potomac...	.....	.....	.....	.....	.....	.....	Included in Spottsylvania, May 8th.
May 16th..	Smoky Hill, Colorado Territory	One company of 1st Colorado Cavalry, and McLain's Colorado Battery.	2	1	1	.....	.....	.....	Official.
May 16th to 30th.	Bermuda Hundred, Virginia.....	Tenth Corps, Major General Q. A. Gillmore, and Eighteenth Corps, Major General W. F. Smith,—Army of the James, Major General B. F. Butler.	200	1,000	.....	.....	.....	3,000*	Official Report of Major General Grant. Major General Walker, C.S.A., was severely wounded.

May 16th..	Belcher's Mills, Virginia	3d New York, 5th and 11th Pennsylvania, and 1st District Columbia Cavalry, of the Army of the James.						Casualty List. File A. No. 139, S. G. O. Engagement during Kautz's raid on the Lynchburg Railroad.
May 17th and 18th.	Adairsville, Georgia	Fourth Corps, Howard's, Army of the Cumberland						Casualty List, S. G. O. Official reports, Union and Confederate. Includes the engagements at the Graves House and Calhoun.
May 17th..	Madison Station, Alabama	3d Division, Fifteenth Corps, Army of the Tennessee						Casualty Return, S. G. O.
May 18th..	Rome, Georgia	2d Division, Davis's; Fourteenth Corps, Palmer's; and Cavalry,—Army of the Cumberland.	16	59				Casualty List, S. G. O.
May 18th..	Kingston, Georgia	2d Division Cavalry, Army of the Cumberland						
May 18th..	Bayou De Glaize, Louisiana	1st and 3d Division of the Sixteenth Corps, portion of the Seventeenth Corps, and Cavalry of the Nineteenth Corps, Major General A. J. Smith, commanding.	60	300			500*	Casualty List, S. G. O. Official Report of Major General N. P. Banks. Engagement during the return of the Red River expedition. Also known as Old Oaks, Yellow Bayou, Simmsport, and Calhoun Station.
May 18th..	Crooked River, Oregon	1st Oregon Cavalry	3	5				Official.
May 19th..	Fayetteville, Arkansas	6th Kansas Cavalry	1					Official.
May 19th..	Welaka and Saunders, Florida	Detachment of the 17th Connecticut Volunteers						Report of Adjutant General of Connecticut, 1865, page 329.
May 19th to 22d.	Cassville, Georgia	Twentieth Corps, Major General Hooker, Army of the Cumberland.	10	46				Official Reports of Lieutenant General J. E. Johnson, C. S. A., and Major General W. T. Sherman, U. S. A. Casualty List, S. G. O.
May 20th..	Downer's Bridge, Virginia	5th New York Cavalry, advance of the 1st Cavalry Division.						
May 20th..	Milford Station, Virginia	1st Division Cavalry, Army of the Potomac					70	
May 21st...	Snia Hills, Missouri	2d Colorado Cavalry						Official.
May 21st...	Mount Pleasant, Mississippi	4th Missouri Cavalry	2	1	10			Official.
May 22d...	Old River, Louisiana	6th Missouri Cavalry						Casualty List, File A, No. 279, S. G. O.
May 23d to 27th.	North Anna River, Virginia	Second Corps, Major General W. S. Hancock; Fifth Corps, Major General G. K. Warren, and Ninth Corps, Major General A. E. Burnside,—Army of the Potomac, Major General G. G. Meade.	223	1,460	290		2,000	Also designated Jericho Ford and Taylor's Bridge. Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, p. 158.
May 23d...	Capture of steam-tug Columbine, at Horse Landing, St. John's River, Florida.	35th U. S. Colored Troops, and sailors on the Columbine	7	5	30			Official report.
May 24th..	Holly Springs, Mississippi	4th Missouri Cavalry	1	2				Official.
May 24th..	Kingston, Georgia	50th Ohio and 14th Kentucky Volunteers, and 2d Kentucky Cavalry.						Ohio in the War, Vol. 2. page 307.
May 24th..	Wilson's Wharf Landing, Virginia	1st District of Columbia and 10th U. S. Colored Troops, and Battery B, U. S. Colored Artillery, commanded by Brigadier General E. A. Wild.	2	24		20	100†	19 Official Report of Major General Benj. F. Butler. Casualty List, S. G. O.
May 24th..	Nashville, Tennessee	15th U. S. Colored Troops	4	8				Official.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1864.	LOCALITY	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
May 25th to June 4th.	Dallas, Georgia	Fourth Corps, Major General O. O. Howard; Fourteenth Corps, Major General J. M. Palmer; Twentieth Corps, Major General Joseph E. Hooker; and Cavalry.—Army of the Cumberland, Major General George H. Thomas: Twenty-third Corps, Army of the Ohio, Major Gen. J. M. Schofield; Fifteenth Corps, Major General J. A. Logan; Sixteenth Corps, Major Gen. G. M. Dodge, and Seventeenth Corps, Major General F. P. Blair.—Army of the Tennessee, Major General J. B. McPherson;—Army of the Military Division of the Mississippi, Major General W. T. Sherman.	.....	.....	2,400*	.....	.....	3,000	Official Report of Major General W. T. Sherman, U. S. A., and Lieutenant General J. E. Johnson, C. S. A. Appendix to Part I, Medical and Surgical History of the War, page 299. Also designated New Hope Church, Burned Hickory, Pumpkin Vine Creek, and Altoona Hills. Major General H. T. Walker, C. S. A., killed.
May 25th..	Cassville Station, Georgia	1st and 11th Kentucky Cavalry, guarding wagon train..	8	16	30	2	6	2	Official Report of Lieut. General Johnson, C. S. A.
May 26th..	Burned Church, Georgia	Cavalry of the 1st Division, McCook's, Army of the Cumberland.	.....	.....	.....	.....	.....	47	Adjutant General's Report, 1864, page 591.
May 26th..	Lane's Prairie, Morris County, Missouri..	Two companies 2d Wisconsin Cavalry.....	5	.....	.....	.....	.....	.....	
May 26th..	Torpedo explosion on Bachelor's Creek, North Carolina.	132d and 158th New York and 58th Pennsylvania Volunteers.	35	19	.....	.....	.....	.....	Casualty List, File A, No. 435.
May 27th..	San Carlos River, California.....	Company K, 5th California Infantry..	1	.....	.....	.....	.....	.....	Official.
May 26th and 27th.	Decatur, Courtland Road, Alabama	1st, 3d, and 4th Ohio Cavalry, 2d Brigade, 2d Division, Cavalry Corps, and 3d Brigade, 4th Division, Sixteenth Corps, commanded by Colonel Eli Long.	.....	.....	30*	.....	.....	15	Casualty List, S. G. O.
May 27th..	Hanoverton, Pamunkey River, Virginia.	1st Division, Torbett's, and 2d Division, Gregg's,—Cavalry Corps, Army of the Potomac, Major General P. Sheridan.	.....	.....	.....	.....	.....	75	Official reports. Casualty List, S. G. O.
May 28th..	Hawe's Shop, Tolopotomy Creek, Virginia.	1st Division, Torbett's, and 2d Division, Gregg's,—Cavalry Corps, Major General P. H. Sheridan, Army of the Potomac.	25	119	200	.....	.....	400	Casualty Lists, S. G. O. Official reports. Also designated Salem Church.
May 28th..	Little Rock, Arkansas.....	57th U. S. Colored Troops.....	.....	.....	6	.....	.....	.....	Official.
May 28th..	Pleasant Hill, Missouri.....	2d Colorado Cavalry.....	.....	2	.....	.....	.....	.....	Official.
May 28th..	Jacksonville, Florida.....	7th U. S. Colored Troops.....	.....	2	.....	.....	.....	.....	Official.
May 28th and 29th.	Moulton, Alabama.....	1st, 3d, and 4th Ohio Cavalry, 2d Cavalry Division, Army of the Cumberland, commanded by Colonel Eli Long.	4	14	.....	15	.....	30	Casualty List, S. G. O.
May 29th to 31st.	Tolopotomy, Virginia.	Second Corps, Hancock's, and Fifth Corps, Warren's, Army of the Potomac.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O. Losses included in North Anna, May 24th.
May 30th..	Hanover Court-House, Virginia.....	3d Division, Wilson's, Cavalry Corps, Army of the Potomac.	20	100	.....	.....	.....	.....	Casualty List, S. G. O.
May 30th..	Ashland, Virginia.....	3d Division, Wilson's, Cavalry Corps, Army of the Potomac.	6	30	.....	.....	.....	.....	Casualty List, S. G. O.
May 30th..	Old Church, Virginia.	1st Division, Torbett's, Cavalry Corps, Army of the Potomac.	16	74	.....	.....	.....	90*	Casualty List, S. G. O.

June 1st to 12th.	Cold Harbor, Virginia	Second Corps, Major General W. S. Hancock; Fifth Corps, Major General G. K. Warren; Sixth Corps, Major General H. G. Wright; Ninth Corps, Major General A. E. Burnside, and Cavalry Corps, Major General P. H. Sheridan,—Army of the Potomac, and Eighteenth Corps, Major General Smith, Army of the James.	1,905	10,570	2,456	.....	1,200	500	Appendix to Part I, Medical and Surgical History of the War, page 156. Official Report of Major General U. S. Grant. Casualty List, S. G. O. Among the casualties was Brigadier Generals G. E. Doles and Keitt. C. S. A., and Brookes and Byrnes, U. S. V., killed. Brig. Generals Tyler, Stannard, and Johnson, U. S. V., and Kirkland, Finnegan, Law, and Lane, C. S. A., wounded.
June 2d...	Bermuda Hundred, Virginia	Tenth Corps, Major General Q. A. Gillmore, of the Army of Virginia and North Carolina, Major General B. F. Butler.	25	100	.....	.....	.....	100	Casualty List, S. G. O.
June 2d...	Engagements at Gaines's Mills, Salem Church, and Hawe's Shop, Virginia...	Cavalry of the Army of the Potomac	.....	.....	.....	.....	.....	.....	Included in Cold Harbor, June 1st to 12th.
June 3d...	Searcy, Arkansas	Detachment of the 8th Missouri Cavalry	.....	2	.....	.....	.....	.....	Official.
June 3d...	Panther Gap, West Virginia	General Hayes' Brigade of the 2d Division, Crook's, of the Army of West Virginia.	.....	.....	25*	.....	.....	25*	Ohio in the War, Vol. 2, pages 224 and 507.
June 3d and 4th.	Ackworth, Georgia	Cavalry of the 2d Division, McCook's, Army of the Cumberland.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Wisconsin, 1865, page 591.
June 6th...	Buffalo Gap, West Virginia	General Hayes' Brigade of the 2d Division, Crook's, of the Army of West Virginia.	.....	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 224.
June 5th...	Piedmont, Virginia	Cavalry and Infantry of the Army of West Virginia, commanded by Major General David Hunter	130	650	.....	460	1,450	1,060	Official Report of Major General U. S. Grant. Casualty List, File A, No. 609, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 228. Also known as Mount Crawford. Gen. W. E. Jones, commanding confederate forces, killed.
June 6th...	Lake Chicot, Arkansas	Sixteenth Corps, commanded by Major General A. J. Smith.	40	70	70	.....	.....	100*	Casualty List, File A, No. 419, S. G. O. Official reports. Also designated Old River Lake, Ditch Bayou, Columbia and Fish Bayou.
June 6th...	Greenland Gap Road, near Moorefield, West Virginia.	22d Pennsylvania Cavalry	.....	12	.....	.....	.....	.....	Casualty Return, S. G. O.
June 7th...	Ripley, Mississippi	Cavalry advance of Major General S. D. Sturgis' command.	.....	.....	.....	.....	.....	.....	Engagement during expedition to Guntown, Miss., June 5th to 10th
June 9th...	Point of Rocks, Maryland	2d U. S. Colored Cavalry	2	.....	.....	.....	.....	.....	Official.
June 9th to 30th.	Kenesaw Mountain, Georgia	Fourth Corps, Major General O. O. Howard; Fourteenth Corps, Major General J. M. Palmer; and Twentieth Corps, Major General Joseph E. Hooker,—Army of the Cumberland, Major General George H. Thomas: Fifteenth Corps, Major General John A. Logan; Sixteenth Corps, Major Gen. G. M. Dodge; and Seventeenth Corps, Major General F. P. Blair,—Army of the Tennessee, Major General James B. McPherson: Twenty-third Corps, Army of the Ohio, Major Gen. J. M. Schofield;—Army of the Military Division of the Mississippi, commanded by Major General W. T. Sherman.	1,370	6,500	800	.....	1,10 †	3,500	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 299. Also designated Lost Mountain, Nose's Creek, Marietta, and Big Shanty. Includes the engagements at Pine Mountain, June 14th; Pine Knob, June 19th; Golgotha, June 16th; Culp's House, June 22d; and the general assault, June 27th; the cavalry engagements at McAfee Cross Roads, Lattemore's Mills, June 20th, and Powder Springs, June 20th. Among the casualties were Lieut. General Polk, C. S. A, and Brigadier Gen. C. G. Harker and McCook, U. S. V., killed.
June 9th...	Mount Sterling, Kentucky	Cavalry of the Division of Kentucky, commanded by General Burbridge.	35	150	.....	50	200	250	Casualty List, S.G.O. Attack on Morgan's raiders.
June 9th...	Lafayette, Tennessee	7th Kansas Cavalry	.....	.....	.....	.....	.....	.....	
June 10th..	Frankfort, Kentucky	Enrolled Kentucky Militia and citizens	.....	3	.....	.....	5	.....	Morgan's raid.
June 10th and 11th.	Lexington, West Virginia	2d Division, Crook's, Army of West Virginia, Major General David Hunter.	6	18	.....	.....	.....	.....	

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
June 10th..	Cane Creek, Alabama	106th Ohio Volunteers	.....	2	.....	3	.....	.....	Skirmish with guerrillas. Ohio in the War, Vol. 2, page 575.
June 10th..	Lexington, Kentucky	4th Kentucky Cavalry	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O. Engagement during Morgan's raid.
June 10th..	Princeton, Kentucky	.....	.....	.....	.....	.....	.....	.....	
June 10th..	Petersburg, Virginia	Cavalry, Brigadier General A. V. Kautz, and portion of the Tenth Corps, Major General Q. A. Gillmore, of the Army of the James.	20	67	.....	.....	.....	.....	Casualty List, S. G. O. Official reports.
June 10th..	Brice's Cross Roads, near Guntown, Mississippi.	4th Missouri, 2d New Jersey, 19th Pennsylvania, 7th and 9th Illinois, 7th Indiana, 3d and 4th Iowa, and 10th Kansas Cavalry, Brigadier Gen. B. H. Grierson; 9th Minnesota, 81st, 95th, 108th, 113th, 114th, and 120th Illinois, 72d and 95th Ohio, and 93d Indiana Volunteers; 1st Illinois, 6th Indiana, and Co. E, 2d Illinois Batteries; 59th (1st Tennessee) and 55th (1st Alabama), U. S. Colored Troops, and Battery F, 2d U. S. Colored Artillery.	223	394	1,623	131	475	.....	Official Report of Major General S. D. Sturgis, commanding.
June 10th..	Corinth, Mississippi	2d New Jersey Cavalry	.....	.....	.....	.....	.....	.....	Engagement during the Guntown expedition.
June 10th..	Cynthiana, Kentucky	168th Ohio (100 days' men)	8	17	280	.....	.....	.....	Captured by Morgan's raiders. Ohio in the War, Vol. 2, page 698.
June 10th..	Kellar's Bridge, Licking River, Kentucky.	171st Ohio (100 days' men), commanded by Brigadier General Hobson.	13	54	700	.....	.....	.....	Captured by Morgan's raiders. Ohio in the War, Vol. 2, page 701.
June 10th and 11th.	Old Church, Virginia	3d Division, Wilson's, Cavalry Corps, Army of the Potomac.	.....	40	.....	.....	.....	.....	Casualty List, S. G. O. Included in Cold Harbor.
June 11th..	Wilson's Landing, Virginia	1st U. S. Colored Cavalry	2	.....	.....	.....	.....	.....	
June 11th..	Cynthiana, Kentucky	Cavalry of the Division of Kentucky, commanded by General Burbridge.	.....	.....	150*	.....	300†	400	Casualty List, S. G. O. Attacks on Morgan's raiders.
June 11th..	Ripley, Mississippi	3d and 4th Iowa, 2d New Jersey, and 4th Missouri Cavalry.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1864, page 952. Official Report of Major General S. D. Sturgis.
June 11th and 12th.	Trevillian Station, Central Railroad, Virginia.	1st Division, Merritt's, and 2d Division, Gregg's, Cavalry Corps, Major General Philip Sheridan,—Army of the Potomac.	85	490	160	.....	.....	370	Casualty List, S. G. O. Official reports. Brigadier General Rosser, C. S. A., wounded.
June 12th..	McAfee's Cross Roads, Georgia	Cavalry of the Army of the Cumberland	.....	.....	.....	.....	.....	.....	Included in Kenesaw Mountain, June 9th to 30th.
June 12th..	Kingsville, Missouri	Scouting party of the 1st Missouri Militia Cavalry	12	.....	.....	.....	.....	.....	Report of Adjutant General of Missouri, 1865, page 448.
June 13th..	White Oak Swamp Bridge, Charles City Cross Roads, Virginia.	3d Division, Wilson's, Cavalry Corps, and 2d Division, Crawford's, Fifth Corps,—Army of the Potomac.	50	250	.....	.....	.....	.....	Casualty List, S. G. O. Also designated Riddle's Shop.
June 13th..	White Post, West Virginia	6th West Virginia Cavalry	.....	2	.....	.....	.....	.....	
June 14th..	Pine Mountain, Georgia	.....	.....	.....	.....	.....	.....	.....	See Kenesaw Mountain, June 9th to 30th.
June 14th..	Lexington, La Fayette County, Missouri.	Detachment of the 1st Missouri Militia Cavalry	8	1	.....	.....	.....	.....	Report of Adjutant General of Missouri, 1865, page 448.
June 14th..	Buchanan, near Lexington, Virginia	Advance of the Army of West Virginia	.....	.....	.....	.....	.....	.....	Major General Hunter, commanding.

June 15th..	Samaria Church, Malvern Hill, Virginia.	3d Division, Wilson's, Cavalry Corps, Army of the Potomac.	25	3	100*	.....	.....	.....	Casualty List, S. G. O.
June 15th..	Moscow, Tennessee	55th U. S. Colored Troops (1st Alabama)	1	.....	.....	.....	.....	.....	Official.
June 15th..	Baylor's Farm, Virginia	3d Division, Hinks', Tenth Corps, Army of the James.	.....	.....	.....	.....	.....	.....	See Petersburg, June 15th to 19th.
June 15th to Apr. 2d, '65.	Siege of Petersburg, Virginia		.....	.....	.....	.....	.....	.....	
June 15th to 19th.	Petersburg, Virginia	Tenth Corps, Major General Q. A. Gillmore; Eighteenth Corps, Major General W. F. Smith,—Army of the James, Major General B. F. Butler: Second Corps, Major General W. S. Hancock; Fifth Corps, Major General G. K. Warren; Sixth Corps, Major General H. G. Wright; and Ninth Corps, Maj. General A. E. Burnside,—Army of the Potomac, Major General G. G. Meade.	1,298	7,474	1,814	.....	.....	.....	Appendix to Part I, Medical and Surgical History of the War, page 164. Casualty List,, S. G. O. Official Report of Major General U. S. Grant. Includes the engagements at Baylor's Farm, June 15th; Walthal and Wier Bottom Church, June 16th.
June 16th..	West Point, Arkansas	9th Iowa Cavalry	1	.....	3	.....	.....	.....	Official.
June 16th..	Otter Creek, near Liberty, Virginia	Advance of the Army of West Virginia, Major General D. Hunter.	3	15	.....	.....	.....	25	Report of Adjutant General of West Virginia.
June 16th..	Wier Bottom Church, Virginia	2d Division, Foster's, Tenth Corps, Army of the James.	.....	.....	.....	.....	.....	.....	See Petersburg, June 15th to 19th.
June 16th..	Golgotha, Georgia	Twentieth Corps	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O. Included in Kenesaw Mountain.
June 16th..	Walthal, Virginia	1st Division, Terry's, Tenth Corps, Army of the James.	.....	.....	.....	.....	.....	.....	See Petersburg, June 15th to 19th.
June 16th..	Pierson's Farm, Virginia	36th U. S. Colored Troops	2	.....	.....	.....	.....	.....	Official.
June 17th..	Nose's Creek, Georgia		.....	.....	.....	.....	.....	.....	Included in Kenesaw Mountain, June 9th to 30th.
June 17th and 18th.	Lynchburg, Virginia	1st Division, Sullivan's, 2d Division, Crook's, and Averill's and Duffie's Cavalry,—Army of West Virginia, commanded by Major General D. Hunter.	100	500	100	.....	.....	200*	Casualty List, File A, No. 324, S. G. O.
June 19th..	Pine Knob, Georgia		.....	.....	.....	.....	.....	.....	Included in Kenesaw Mountain, June 9th to 30th.
June 19th..	Kearsarge and Alabama, off Cherbourg, France.	U. S. steamer Kearsarge	.....	3	.....	9	21	70	Official Report of Captain John A. Winslow, U. S. Navy, commanding the Kearsarge.
June 20th..	White House, Virginia	Brigade of Union troops, commanded by Brigadier General Abererombie.	.....	.....	.....	.....	.....	.....	
June 20th..	Liberty, Virginia	2d Division, Averill's, Cavalry, Army of West Va	.....	.....	.....	.....	.....	.....	
June 20th..	Powder Spring, Georgia	Cavalry of the Army of the Cumberland	.....	.....	.....	.....	.....	.....	Included in Kenesaw Mountain, June 9th to 30th.
June 20th..	Lattemore's Mills, Noonday Creek, Ga..	Cavalry of the Army of the Cumberland	.....	.....	.....	.....	.....	.....	Included in Kenesaw Mountain, June 9th to 30th.
June 20th to 30th.	Trenches in front of Petersburg	Fifth and Ninth Corps, Army of the Potomac, and Tenth and Eighteenth Corps, Army of the James.	112	506	800	.....	.....	.....	Official Report of Lieutenant General U. S. Grant. Appendix to Part I, Medical and Surgical History of the War, page 164. Generals Chamberlain and Egan, U. S. V., wounded.
June 21st..	Salem, Virginia	Averill's Cavalry, 2d Division, Army of West Va	6	10	.....	.....	10†	.....	
July 21st..	Pine Bluff, Arkansas	27th Wisconsin	.....	.....	.....	.....	.....	.....	
June 21st..	Naval engagement on the James River, near Dutch Gap.		.....	.....	.....	.....	.....	.....	
June 21st..	White House Landing, Virginia	Portion of the 1st and 2d Divisions, Cavalry Corps, Army of the Potomac.	.....	30	.....	.....	.....	.....	Casualty List, S. G. O. Appendix to Part I. Medical and Surgical History of the War, p. 180.
June 21st..	Buford's Gap, Virginia	23d Ohio Volunteers, of the Army of West Virginia	15	.....	.....	.....	.....	.....	

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
June 22d..	White River, Arkansas.....	Three companies of the 12th Iowa, and U. S. steamer Lexington.	2	4	2	2	3	3	Report of Adjutant General of Iowa. 1864, p. 1079. Official Report of Ensign H. Booby, U. S. N.
June 22d to 30th.	Wilson's raid on the Weldon Railroad, Virginia.	Cavalry of the Army of the James, Brigadier General A. V. Kautz, and 3d Cavalry Division, Army of the Potomac, Major General Wilson, commanding.	76	265	700	.....	300†	.....	Casualty Lists, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 164.
June 22d.	Culp's House, Georgia.....	.....	.....	.....	.....	.....	.....	.....	Included in Kenesaw Mountain, June 9th to 30th.
June 22d..	Ream's Station, Virginia.....	Kautz's Cavalry, Army of the James, 3d Division, Cavalry, Army of the Potomac, Major General Wilson.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O. Wilson's raid, June 22d to 30th.
June 22d and 23d.	Weldon Railroad, Virginia.....	Second Corps, Birney, Sixth Corps, Wright, and the 1st Division, Gibbons, of the Fifth Corps,—Army of the Potomac, Major General George G. Meade.	604	2,494	2,217	.....	300	200	Also designated Williams' Farm, Davis' Farm, and Jerusalem Plank Road. Official Report of Lieut. General U. S. Grant. Casualty List, S. G. O. Appendix to Medical and Surgical History of the War, page 104.
June 23d..	Nottoway Court-House, Virginia.....	3d Cavalry Divison, Wilson's, Army of the Potomac...	16	52	34	15	50	.....	Casualty List, S. G. O. Wilson's raid on the Weldon Railroad, June 22d to 30th.
June 23d..	Colliersville, Mississippi.....	Train on the Charlestown and Mississippi Railroad.....	2	8	5	.....	.....	.....	Army and Navy Journal, Vol. I, page 786.
June 23d..	Jones' Bridge, Virginia.....	1st Division, Torbett's, and 2d Division, Gregg's, Cavalry Corps, Army of the Potomac, and 28th U. S. Colored Troops.	14	45	100	.....	.....	50*	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 180.
June 24th..	Samaria Church, Virginia.....	1st Division, Torbett's, and 2d Division, Gregg's, Cavalry Corps, Army of the Potomac.	40	190	200	.....	200†	.....	Casualty List, S. G. O. Appendix to Part I. Medical and Surgical History of the War, page 180.
June 24th..	White River, Arkansas	U. S. steamer Queen City and gunboats.....	.....	40	.....	.....	.....	.....	Army and Navy Journal, Vol. I, page 786.
June 24th..	Staunton Bridge, Virginia.....	3d Division, Wilson's, Cavalry Corps, Army of the Potomac, and Kautz's Cavalry, Army of the James.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O. Wilson's raid on the Weldon Railroad, June 22d to 30th.
June 24th..	La Fayette, Macon County, Tennessee..	.....	.....	.....	.....	.....	.....	100*	
June 25th..	Point Pleasant, Louisiana.....	64th U. S. Colored Troops.....	.....	.....	.....	.....	.....	.....	Official.
June 25th to 29th.	Clarendon, St. Charles River, Arkansas.	11th Missouri, 9th Iowa, and 3d Michigan Cavalry, 126th Illinois Volunteers, and Battery D, 2d Missouri Artillery.	.....	200	.....	.....	200	200	Report of Adjutant General of Iowa, 1867, Vol. II, page 561. Also known as Pikesville and Saint Charles.
June 27th..	Kenesaw Mountain (general assault)....	Fourth Corps, Major General O. O. Howard; Fourteenth Corps, Major General J. M. Palmer; Twentieth Corps, Major Gen. Joseph E. Hooker, and Cavalry,—Army of the Cumberland, Major General Geo. H. Thomas; Fifteenth Corps, Major General John A. Logan; Sixteenth Corps, Major Gen. G. M. Dodge; and Seventeenth Corps, Major General F. P. Blair,—Army of the Tennessee, Major General James B. McPherson; Twenty-third Corps, and Cavalry,—Army of the Ohio, Major General J. M. Schofield.	.....	3,000†	.....	.....	600†	.....	Casualty Lists, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 301. Included in Kenesaw Mountain, June 9th to 30th. Generals Harker and McCook, U. S. V., killed.
June 27th..	Charlestown, West Virginia.....	1st Division, Army of West Virginia.....	.....	7	.....	.....	.....	.....	Casualty List, S. G. O.
June 28th..	Stoney Creek, Virginia.....	Cavalry, Army of the James, Kautz's, and 3d Division, Cavalry, Wilson's, Army of the Potomac.	.....	.....	.....	.....	.....	.....	Casualty List. S. G. O. See Wilson's raid on the Weldon Railroad, June 22d to 30th.
June 29th..	Ream's Station, Virginia.....	Cavalry, Army of the James, Kautz's, and 3d Division, Cavalry, Wilson's, Army of the Potomac.	.....	.....	.....	.....	.....	.....	Casualty List. S. G. O. See Wilson's raid on the Weldon Railroad, June 22d to 30th.

June ——	La Fayette, Georgia	4th and 6th Kentucky Cavalry							Report of Adjutant General of Kentucky, Vol. I page 465.
July 1st to 31st.	Front of Petersburg, Virginia	Second, Fifth, and Ninth Corps, Army of the Potomac, Major Gen. G. G. Meade, and Tenth and Eighteenth Corps, Army of the James, Major Gen. B. F. Butler.	419	2,076	1,200				The losses at the crater July 30th, and Deep Bottom, July 27th, not included. Casualty Lists, S. G. O.
July 2d...	Pine Bluff, Arkansas	64th U. S. Colored Troops	6		1				Official.
July 2d...	Salisbury, Mississippi	3d Iowa Cavalry				2	3		Report of Adjutant General of Iowa, 1864, p. 955.
July 2d...	Fort Johnson, James' Island, South Carolina.	Troops of the Department of the South	19	97	135				Casualty Return, S. G. O.
July 2d to 5th.	Nickajack Creek, Georgia	Army of the Cumberland, Major General George H. Thomas; Army of the Tennessee, Major General J. B. McPherson,—Grand Army of the Mississippi, Major General W. T. Sherman.	60	310			1001		Appendix to Part I, Medical and Surgical History of the War, page 301. Casualty List, S. G. O. Official reports. Also known as Smyrna and Vining Station.
July 3d...	Platte City, Missouri	9th Missouri Militia Cavalry		2	70				Official.
July 3d...	North Mountain, Virginia	Outpost of the 135th Ohio National Guards, of Sigel's command.			300				Ohio in the War, Vol. 2, page 664.
July 3d to 9th.	Expedition from Vicksburg to Jackson, Mississippi.	Troops of the 1st Division, Seventeenth Corps, commanded by Major General Dennis.		150			200		The Confederate General Gholson was wounded.
July 3d...	Leetown, Virginia	1st New York Cavalry and 10th West Virginia Volunteers, commanded by Major General Sigel.	3	12	17				Casualty List, File A, No. 429, S. G. O.
July 3d...	Hammack's Mills, North River, West Va.	153d Ohio National Guards	3	7					Ohio in the War, Vol. 2, page 684.
July 4th...	Searcy, Arkansas	Detachment of the 3d Arkansas Cavalry				7	4	56	Official Report of Major General Steele.
July 4th...	Vicksburg, Mississippi	48th U. S. Colored Troops (10th Louisiana)	1	7	2				Official.
July 4th...	Clay County, Missouri	9th Missouri Militia Cavalry	2	2					Official.
July 4th...	Clinton, Mississippi	2d Wisconsin Cavalry, advance of the 1st Division, Seventeenth Corps, commanded by Major General Dennis.							Engagement during Dennis's expedition to Jackson, Mississippi.
July 4th...	Point of Rocks, Maryland	Maryland Potomac Home Brigade							Casualty List, File A, No. 429, S. G. O.
July 4th and 5th.	Coleman's Plantation, near Port Gibson, Mississippi.	52d U. S. Colored Troops (2d Mississippi) and Mississippi Marine Brigade.	6	18	15				Official.
July 5th to 18th.	Smith's expedition from La Grange, Tennessee, to Tupelo, Mississippi.	1st and 3d Divisions, Sixteenth Corps, Major General J. A. Mower; Cavalry Brigade, Brig. General B. H. Grierson; and one brigade U. S. Colored Troops.							Official Report of Major General A. J. Smith, commanding expedition. Casualty Lists, S. G. O.
July 5th to 7th.	John's Island, South Carolina	Troops of the Department of the South, Major General Foster.	16	82	12	20	80		Official.
July 5th...	Hagerstown, Pleasant Valley, Maryland	1st Maryland Cavalry, Potomac Home Brigade, commanded by Major Cole.	2	6	25				Casualty List, File A, No. 429, S. G. O.
July 5th and 6th.	Jackson, Mississippi	2d Wisconsin, 5th and 11th Illinois, and 3d U. S. Colored Cavalry, and 46th, 76th, and 79th Illinois Volunteers, of the 1st Division, Seventeenth Corps.							Engagement during the return of Major General Dennis's expedition from Vicksburg to Jackson, Mississippi.
July 6th...	Little Blue, Missouri	2d Colorado Cavalry	8	1					Official.
July 6th...	Mount Zion Church, Virginia	2d Massachusetts Cavalry	8	8	38		5		Partizan Life with Mosby, page 249. Report of Adjutant General of Massachusetts.
July 4th to 7th.	Bolivar and Maryland Heights, Virginia.	Reserve Division of the Army of West Virginia, Major General Sigel, commanding.	20	80					Casualty List, File A, No. 429, S. G. O.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
July 6th to 10th.	Chattahoochie River, Georgia	Army of the Ohio, Major Gen. J. M. Schofield; Army of the Tennessee, Major General J. B. McPherson; Army of the Cumberland, Major General George H. Thomas,—Army of the Military Division of the Mississippi, Major General W. T. Sherman.	80	450	200	.....	.....	600*	Casualty Lists, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 301. Official reports.
July 7th...	Hagar's Mountain and Middleton, Maryland.	8th Illinois Cavalry and Alexander's Baltimore Battery.	.....	.....	.....	.....	.....	.....	Official Report of Colonel Clendenin.
July 7th...	Clinton, Mississippi	11th Illinois and 2d Wisconsin Cavalry, and Battery of the 2d Illinois Artillery.	.....	.....	.....	.....	.....	.....	Engagement during the return of Dennis's expedition from Vicksburg to Jackson, Mississippi.
July 7th...	Solomon's Gap, Frederick City, Maryland.	8th Illinois Cavalry, 3d Maryland Potomac Home Brigade, and Alexander's Baltimore Battery.	5	20	.....	.....	.....	.....	Official Report of Major General Lew Wallace.
July 7th...	Ripley, Mississippi	2d Iowa Cavalry	.....	4	.....	10	.....	.....	Report of Adjutant General of Iowa. 1864, p. 933. Engagement during Smith's expedition to Tupelo, July 5th to 18th.
July 9th...	Monocacy, Maryland	1st and 2d Brigades of the 3d Division, Sixth Corps, Major General J. B. Ricketts, and detachment of the Eight Corps, Brigadier General E. B. Tyler.	90	579	1,290	.....	400	.....	Casualty List, File A, No. 603, S. G. O. Official Report of Major General Lew Wallace, commanding.
July 11th to 22d.	Rosseau's raid in Alabama and Georgia...	8th Indiana, 5th Iowa, 9th Ohio, 2d Kentucky, and 4th Tennessee Cavalry, and Battery E, 1st Michigan Artillery.	3	30	.....	.....	.....	.....	Casualty List, S. G. O. Includes engagements at Ten Islands, July 14th; Stone's Ferry, 15th; Auburn, 18th; and Chewa Station, 20th.
July 11th..	Pontotoc, Mississippi	8th Wisconsin, 5th Minnesota, and 11th Missouri Volunteers, and 2d Iowa Cavalry, of Major General A. J. Smith's forces.	.....	.....	.....	.....	.....	.....	Engagement during Smith's expedition to Tupelo, July 5th to 18th.
July 12th.	Fort Stevens, Washington, D. C	1st and 2d Divisions, Sixth Corps, Twenty-second Corps, convalescents. Marines, Home Guards, and citizens, commanded by Major General Augur.	54	319	.....	.....	.....	500*	Casualty Return, File F, No. 106, S. G. O.
July 12th.	Petit Jean, Arkansas River, Arkansas...	One company of the 3d Arkansas Cavalry	.....	.....	.....	2	8	.....	Official Report of Major General F. Steele.
July 12th..	Lee's Mills, near Ream's Station, Va....	2d Division, Gregg's, Cavalry Corps, Army of the Potomac.	3	13	30	.....	.....	25*	Casualty List, S. G. O.
July 13th to 15th.	Tupelo, Mississippi	1st and 3d Divisions, Sixteenth Corps, Major General J. A. Mower; Cavalry, Brigadier General B. H. Grierson; and a Brigade of Colored Troops, Major General A. J. Smith, commanding.	85	563	.....	100	600	.....	Casualty List, File A, No. 202, S. G. O. Official reports. Includes the engagements at Harrisburg, July 13th, and Old Town Creek, July 15th.
July 14th and 15th.	Ozark, Missouri	14th Kansas Cavalry	2	1	.....	.....	.....	.....	Official.
July 14th..	Ten Islands, Coosa River, Alabama	8th Indiana and 5th Iowa Cavalry	.....	.....	.....	15	40	22	Also designated Jackson's Ford. Engagement during Rosseau's raid, July 11th to 22d.
July 14th..	Farr's Mills, Montgomery County, Ark..	A battalion of the 4th Arkansas Cavalry	1	7	.....	4	6	.....	Official Report of Major General F. Steele.
July 15th..	Stone's Ferry, Tallapoosa River, Ala....	.....	.....	.....	.....	.....	.....	.....	Engagement during Rosseau's raid in Alabama and Georgia, July 11th to 22d.
July 16th and 17th.	Grand Gulf, Port Gibson, Mississippi....	72d and 76th Illinois Volunteers, 2d Wisconsin Cavalry, and 53d U. S. Colored Troops, of the Seventeenth Corps, Major General Sloeum.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Illinois, Vol. II, page 210.
July 17th..	Snicker's Gap, Virginia	Army of West Virginia, Major General Crook	.....	.....	.....	.....	.....	.....	

July 17th..	Fredericksburg, Missouri	2d Colorado Cavalry	6	1					Official.
July 18th..	Auburn, Georgia	9th Ohio and 4th Tennessee Cavalry							Engagement during Rosseau's raid in Alabama and Georgia, July 11th to 22d.
July 18th..	Chewa Station, Montgomery and West Point Railroad, Georgia.	8th Indiana, 5th Iowa, and 4th Tennessee Cavalry						40*	Engagement during Rosseau's raid in Alabama and Georgia, July 11th to 22d.
July 18th..	Snicker's Ferry, Island Ford, Shenandoah River, Virginia.	Army of West Virginia, Major General Crook, and a portion of the Sixth Corps, Major General Wright.	30	181	100				Official reports. Casualty Returns, S. G. O.
July 18th..	Ashby's Gap, Virginia	Cavalry of the Army of West Virginia, Brigadier Gen. Duffie.			200*				
July 19th..	Darksville, Virginia	Portion of the Army of West Virginia, commanded by General Averill.							
July 20th..	Winchester, Virginia	2d Cavalry Division, Army of West Virginia, commanded by Brigadier General Averill.	37	175	30		300	200	Casualty List, S. G. O. General Dilly, C. S. A., was wounded. Also designated Stevenson's Depot and Carter's Farm.
July 20th..	Peach-Tree Creek, Georgia	Fourth Corps, Major General O. O. Howard; Fourteenth Corps, Major General J. M. Palmer; and Twentieth Corps, Major General Joseph E. Hooker,—Army of the Cumberland, Major General George H. Thomas, of the Army of the Military Division of the Mississippi, Major General W. T. Sherman.	300	1,410		1,113	2,500	1,183	Casualty List, S. G. O. Appendix to Part I. Medical and Surgical History of the War, page 301. Official Reports of Generals Sherman and Johnston. Brigadier Generals W. S. Featherstone, A. L. Long, J. J. Pettis, and G. M. Stevens, C. S. A., were killed.
July 21st..	Deep Bottom, Virginia	1st Division, Tenth Corps, Army of the James	5	26					Official reports. Casualty Returns, S. G. O.
July 21st..	Henderson, Kentucky								
July 22d...	Atlanta, Georgia (Hood's first sortie)	Fifteenth Corps, Major General Logan; Sixteenth Corps, Major General Dodge; and Seventeenth Corps, Major General Blair,—Army of the Tennessee, Major General McPherson, of the Army of the Military Division of the Mississippi, Major General W. T. Sherman.	500	2,141	1,000	2,482	4,000	2,017	Official Report of Major General W. T. Sherman. Appendix to Part I, Medical and Surgical History of the War. Casualty List, S. G. O. Major General J. B. McPherson and Brigadier General L. Greathouse, of the Union army, were killed.
July 22d...	Vidalia, Louisiana	6th U. S. Colored Heavy Artillery (2d Mississippi)	6	1					Official.
July 22d...	Decatur, Georgia	2d Brigade, 4th Division, Sixteenth Corps, Army of the Tennessee, Colonel Sprague, commanding.							Major General W. H. T. Walker, C. S. A., was killed.
July 23d...	Kernstown, Virginia	Cavalry of the Army of West Virginia							
July 24th..	Winchester, Virginia	Portion of the Army of West Virginia, commanded by General Crook.			1,230*			600*	Casualty List, File A., S. G. O.
July 24th..	Steamer Clara Bell, Carrolton Landing, Caroline Bend, Mississippi.	6th Michigan Artillery		8					Casualty List, S. G. O.
July 25th..	Courtland, Alabama	18th Michigan and 32d Wisconsin Volunteers							Official.
July 26th..	Wallace's Ferry, Big Creek, Arkansas	15th Illinois Cavalry, Co. E, 2d U. S. Colored Artillery, and 60th (1st Iowa) and 56th (3d Arkansas) U. S. Colored Troops, commanded by Colonel W. S. Brooks, 56th U. S. Colored Troops.	16	32	5		150		Official Report of Major General F. Steele.
July 26th..	Des Arc, Arkansas	11th Missouri Cavalry		5					Official.
July 26th to 31st.	Stoneman's raid to Macon, Georgia	Stoneman's and Garrard's Cavalry Divisions of the Army of the Cumberland.		100†	900				Includes engagements at Macon, July 30th, and Hillsboro' on the 31st. Official reports.
July 26th to 31st.	McCook's raid to Lovejoy Station, Ga.	1st Wisconsin, 5th and 8th Iowa, 2d and 8th Indiana, 1st and 4th Tennessee, and 4th Kentucky Cavalry.		100†	500				Official Report of Major General Sherman. Includes engagements at Campbelltown on the 28th, Lovejoy's Station on the 29th, and Newnan and vicinity on the 31st.
July 26th..	St. Mary's Trestle, Florida	75th Ohio Mounted Infantry							Ohio in the War, Vol. 2, page 437.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
July 27th..	Mazzard Prairie. Fort Smith, Arkansas..	Two hundred men of the 6th Kansas Cavalry.....	12	17	152	12	20	.....	Casualty Return, S. G. O. Official Report of Major General F. Steele.
July 27th and 28th.	Deep Bottom, Newmarket, and Malvern Hill, Virginia.	1st Division, Tenth Corps, and Cavalry, Army of the James; Second Corps, Major General Hancock, and 1st Division, Torbett's, and 2d Division, Gregg's, Cavalry Corps, Major General Sheridan, Army of the Potomac, Major General G. G. Meade.	55	279	.....	.....	.....	.....	Casualty Lists, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 165.
July 27th..	Whiteside, Black Creek, Florida.....	35th U. S. Colored Troops (1st North Carolina).....	.....	.....	.....	.....	.....	.....	
July 28th..	Tah-kah-o-kuty, Dakota Territory.....	8th Minnesota Mounted Infantry, 6th and 7th Iowa, and Dakota and Brackett's Minnesota Cavalry, commanded by Brigadier General A. Sully.	.....	.....	.....	.....	.....	.....	Engagement with Indians; 125 Indians killed. Official Report of Major General John Pope.
July 28th..	Atchafalaya River, Louisiana.....	Portion of the Nineteenth Corps	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Wisconsin, 1865, page 442.
July 28th.	West Point, Arkansas.....	11th Missouri Cavalry.....	.....	2	10	.....	.....	.....	Official.
July 28th..	Ezra Chapel. Atlanta, Ga. (second sortie).	Fifteenth Corps, Major General Logan; Sixteenth Corps, Major General Dodge; Seventeenth Corps, Major Gen. Blair,—Army of the Tennessee, Major General O. O. Howard.	100	600	.....	642	3,000	1,000	Official Report of Major General Sherman. Appendix to Part I, Medical and Surgical History of the War, page 299. Casualty Lists, S. G. O.
July 28th..	Campbelltown, Georgia	Portion of McCook's Cavalry, of the Army of the Cumberland.	.....	.....	.....	.....	.....	.....	Skirmish during McCook's raids, July 26th to 30th.
July 28th..	Flat Shoals, Georgia.....	Portion of General Garrard's Cavalry, of the Army of the Cumberland.	.....	.....	.....	.....	.....	.....	Engagement during Stoneman's raid, July 26th to 31st.
July 28th to Sep. 2d.	Siege of Atlanta, Georgia.....	Army of the Cumberland, Major Gen. G. H. Thomas; Army of the Tennessee, Major Gen. O. O. Howard; and Army of the Ohio, Major Gen. J. M. Schofield.—of the Army of the Military Division of the Mississippi, Major General W. T. Sherman.	.....	.....	.....	.....	.....	.....	Losses include those of Utoy Creek, August 5th. Casualty Returns, S. G. O. Appendix to Part I, Medical and Surgical History of the War, p. 299. Official reports.
July 30th..	Mine explosion at Petersburg, Virginia..	The attacking column was composed of the Ninth Corps, Major General Burnside, supported by the Eighteenth Corps, with the Second and Fifth Corps in reserve.	419	1,679	1,910	400	600	200	Casualty List, S. G. Appendix to Part I, Medical and Surgical History of the War, page 165. Official Reports of Major General Grant.
July 29th to 31st.	Fort Smith, Arkansas	.....	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Indiana, Vol. III, page 389.
July 29th and 30th.	Lovejoy Station, Georgia.....	Cavalry of the Army of the Cumberland, commanded by General McCook.	.....	.....	.....	.....	.....	.....	Engagement during McCook's raid, July 26th to 31st.
July 29th..	Clear Springs, Maryland	12th and 14th Pennsylvania Cavalry	.....	.....	.....	.....	17†	.....	Four Years in the Saddle, page 208.
July 30th..	Newnan, Georgia.....	Cavalry of the Army of the Cumberland, commanded by General McCook.	.....	.....	.....	.....	.....	.....	Engagement during McCook's raid, July 26th to 31st.
July 30th..	Chambersburg, Pennsylvania.....	.....	.....	.....	.....	.....	.....	.....	Burned by order of Brig. Gen. McCausland, C. S. A.
July 30th..	Macon, Georgia.....	Cavalry of the Army of the Cumberland, commanded by General Stoneman.	.....	.....	.....	.....	.....	.....	See Stoneman's raid to Macon, July 26th to 31st.
July 30th..	Lee's Mills, Virginia	Davis's Brigade, 2d Cavalry Division. Army of the Potomac.	2	11	.....	.....	.....	.....	Casualty List, S. G. O.
July 30th..	Lebanon, Kentucky.....	One company of the 12th Ohio Cavalry	.....	.....	.....	6	.....	.....	Ohio in the War, Vol. 2, page 823.

July 31st..	Hilisboro', Georgia	Cavalry of the Army of the Cumberland, commanded by General Stoneman.			600				See Stoneman's raid to Macon, July 26th to 31st. Also designated Sunshine Church.
Aug. 1st..	Rolla, Missouri	5th Missouri Militia Cavalry	2						Official.
Aug. 1st to 31st.	Trenches before Petersburg, Virginia	Second, Fifth, and Ninth Corps, Army of the Potomac, and Eighteenth Corps, Army of the James.	87	484					Official reports. List of easualties, S. G. O.
Aug. 1st...	Cumberland, Maryland	Command of Brigadier General B. F. Kelly		30			30		Also designated Flock's Mills.
Aug. 2d...	Green Springs Depot, West Virginia, near Oldtown. Maryland.	153d Ohio Volunteers	1	5	90	5	22		Casualty Returns, S. G. O. Four Years in the Saddle, Gilmor, page 221.
Aug. 2d...	Osceola, Arkansas	2d and 3d Militia and 1st and 6th Missouri Cavalry				7		25	Official Report of Col. J. L. Burris, commanding.
Aug. 3d...	Elkshute, Missouri			3		7		28	Official Report of Col. J. L. Burris, commanding.
Aug. 4th...	New Creek, West Virginia			50			80		Four Years in the Saddle, Gilmor, page 221.
Aug. 5th to 23d.	Forts Gaines and Morgan, Mobile Harbor, Alabama.	U. S. steamships Brooklyn, Octorora, Hartford, Ossipee, Itasca, Oneida, Galena, Metacomet, Richmond, Port Royal, Lackawanna. Seminole, Monongahela, and Tecumseh, commanded by Admiral Farragut, and Thirteenth Army Corps, Major General Granger.	75	170				2, 314	Official Report of Rear-Admiral D. G. Farragut, commanding the west gulf blockading squadron. Besides those killed, over 100 were drowned by the sinking of the Tecumseh. The Confederate Admiral Buchanan was wounded, and Commodore Craven, U. S. N., drowned. Fort Gaines surrendered Aug. 8th and Fort Morgan Aug, 23d.
Aug. 5th and 6th.	Utoy Creek, Georgia	Armies of the Cumberland, Tennessee, and Ohio							Casualty List, S. G. O. Included in the siege of Atlanta, July 28th to Sept. 2d.
Aug. 5th to 7th.	Cowskin, Missouri	8th Missouri Militia Cavalry	6						Official.
Aug. 5th...	Decatur, Georgia	2d Division Cavalry, Army of the Cumberland							Casualty List, S. G. O.
Aug. 5th...	Donaldsonville, Louisiana	11th New York Cavalry			60				
Aug. 5th...	Cabin Point, Virginia	1st U. S. Colored Cavalry	2						
Aug. 6th...	Plaquemine, Louisiana	4th Wisconsin Cavalry and 11th (14th Rhode Island) Heavy Artillery.	2		3				Official. Also designated Indian City Village.
Aug. 7th...	Moorefield, Virginia	14th Pennsylvania, 8th Ohio, 1st and 3d West Virginia, and 1st New York Cavalry, commanded by Brigadier General Averill.	9	22			100†	400	Casualty List, S. G. O. Four Years in the Saddle, Gilmor, page 225.
Aug. 7th to 9th.	Tallahatchie River, Mississippi	Cavalry, Brigadier General Hatch, and infantry, Major General Mower, of the Sixteenth Corps, commanded by Major General A. J. Smith.							Report of Adjutant General of Missouri, 1865, p. 381.
Aug. 8th...	Fort Gaines, Alabama	U. S. fleet, commanded by Admiral Farragut							See Mobile Harbor, August 5th to 23d.
Aug. 8th...	Two Hills Bad Lands, Little Missouri River, Dakota Territory.	8th Minnesota Volunteers and 2d Minnesota, 6th and 7th Iowa, Brackett's Battalion Minnesota, and 1st Battalion Dakota Cavalry.							Official Report of Major General John Pope. Engagement with Indians; 100 Indians killed.
Aug. 9th...	Explosion of ammunition at City Point, Virginia.		70	130					
Aug. 10th..	U. S. steamer Empress, Mississippi		6	12					
Aug. 10th..	Berryville Pike, Virginia	Reserve Brigade and 1st Cavalry Division, Major Gen. Torbett, Army of the Potomac.	4	20					Official Report of Major General Sheridan. Casualty List, S. G. O.
Aug. 11th..	Sulphur Springs Bridge and White Post, Virginia.	1st and 3d Divisions and Reserve Brigade. Cavalry Corps, Major General Torbett, Army of the Potomac.	30	70	200				Official report of Major General Sheridan. Casuality List, S. G. O.
Aug. 11th..	Van Buren, Crawford County, Arkansas.	2d and 6th Kansas Cavalry							

† Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Aug. 12th..	Abbeville and Oxford, Mississippi	Cavalry, Brigadier General Hatch, and infantry, Major General Mower, of the Sixteenth Corps, Major Gen. A. J. Smith.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Missouri, 1865, page 149.
Aug. 12th..	Little Blue, Dakota Territory	Detachment of the 7th Iowa Cavalry	2	.....	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1865, p. 144. Engagement with Indians; 12 Indians killed.
Aug. 13th..	Near Snicker's Gap, Virginia.....	144th and 149th Ohio Volunteers (one hundred days' men), guarding a supply train.	4	10	200	2	3	.....	Ohio in the War, Vol. 2, page 680. Partizan Life with Mosby, page 276.
Aug. 14th..	Gravel Hill, Virginia	2d Division, Major General Gregg, Cavalry, Army of the Potomac.	3	18	.....	.....	.....	.....	Casualty List, S. G. O.
Aug 14th to 18th.	Strawberry Plains, Deep Bottom Run, Virginia.	2d Cavalry Division, Gregg's; Second Corps, Major General Hancock,—Army of the Potomac, Major General Meade; and Tenth Corps, Major General Birney,—Army of the James, Major General Butler.	400	1,755	1,400	.....	1,000	100	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 173. General Girard, C. S. A., and General Chaplin, U. S. V., were killed.
Aug. 14th..	Hurricane Creek, Mississippi.....	Cavalry, Hatch's, and infantry, Mower's, of the Sixteenth Corps, commanded by Major General A. J. Smith.	.....	.....	.....	.....	.....	.....	
Aug. 14th to 16th.	Dalton, Georgia	2d Missouri Volunteers and 14th U. S. Colored Troops, commanded by Colonel Siebold, 2d Missouri Vols.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Missouri, 1865, page 103.
Aug. 15th..	Fisher's Hill, near Strasburg, Virginia..	1st Cavalry Division, Army of the Potomac, and Sixth and Eighth Corps.	.....	30	.....	.....	.....	.....	Casualty List, S. G. O. Official Report of Major General Sheridan.
Aug. 16th..	Smoky Hill Crossing, Kansas.....	Detachments of the 7th Iowa and U. S. Cavalry.....	4	.....	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1865, p. 143. Engagement with Indians.
Aug. 16th..	Crooked Run, Front Royal, Virginia....	1st and 2d Brigades, 1st Cavalry Division, Army of the Potomac, commanded by General Merritt.	13	58	.....	30	150	300	Casualty List, S. G. O. Official Report of Major General Sheridan.
Aug. 17th..	Gainesville, Florida.....	75th Ohio Mounted Infantry	16	30	102	.....	.....	.....	Ohio in the War, Vol. 2, page 437.
Aug. 17th.	Cleveland, Tennessee	6th Ohio Heavy Artillery	.....	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 912.
Aug. 17th..	Winchester, Virginia.....	3d Division Cavalry, Wilson's, Army of the Potomac, and the New Jersey Brigade, Sixth Corps.	.....	50	250	.....	.....	.....	Casualty List, S. G. O. Official Report of Major General Sheridan.
Aug. 18th..	Decatur, Alabama	2d Division Cavalry, Army of the Cumberland, and 1st U. S. Colored Heavy Artillery.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O.
Aug. 18th, 19th, and 21st.	Six-Mile House, Weldon Railroad, Va...	Kautz's Cavalry and the 2d Cavalry Division, Gregg's, Fifth Corps, Major General G. K. Warren, and Ninth Corps, Major General J. G. Parke—Army of the Potomac.	212	1,155	3,176	.....	2,000	2,000	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 173. Brig. Generals Saunders and Lamar, C. S. A., killed, and Generals Claigman, Barton, Finnegan, and Anderson, C. S. A., were wounded.
Aug. 18th..	Fairburn, Georgia	Cavalry, Army of the Cumberland	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O.
Aug. 19th..	Snicker's Gap Pike, Virginia	Detachment of the 5th Michigan Cavalry	30	3	.....	.....	.....	.....	"All the prisoners who were taken, and all the wounded who had fallen by the way, were put to death." Partizan Life with Mosby, page 282.
Aug. ——	Block-House No. 4, Nashville and Chattanooga Railroad, Tennessee.	One company of the 115th Ohio Volunteers.....	.....	.....	25*	.....	.....	.....	Ohio in the War, Vol. 2, page 602.
Aug. 19th..	Martinsburg, Virginia.....	One company of cavalry of Averill's command.....	.....	25†	.....	.....	.....	.....	

Aug. 18th to 22d.	Kilpatrick's raid on the Atlanta Railroad.	Cavalry of the Army of the Cumberland	.....	400	.....	.....	.....	Includes engagements at Red Oak on the 19th and Jonesboro' and Lovejoy Station on the 20th.
Aug. 19th..	Red Oak, Georgia	Cavalry of the Army of the Cumberland	.....	.....	.....	.....	.....	Casualty List, S. G. O. Engagement during Kilpatrick's raid, August 18th to 22d.
Aug. 19th and 20th.	Jonesboro', Georgia	2d Division Cavalry, Army of the Cumberland	.....	.....	.....	.....	.....	Casualty List, S. G. O. Engagement during Kilpatrick's raid, August 18th to 22d.
Aug. 19th..	Pine Bluff, Tennessee River, Tenn.	Detachment of Co. B, 83d Illinois Mounted Infantry	8	.....	.....	.....	.....	Casualty List, File A, No. 416, S. G. O. Killed and mutilated by guerillas.
Aug. 20th..	Lovejoy Station, Georgia	Cavalry, Army of the Cumberland	.....	.....	.....	.....	.....	Casualty List, S. G. O. Kilpatrick's raid, August 18th to 22d.
Aug. 21st..	Summit Point, Virginia	1st Division, Merritt's, and 3d Division, Wilson's, Cavalry Corps, and Sixth Corps, Major General Wright, of the Army of the Middle Military Division, Major General Sheridan.	.....	.....	600*	.....	400*	Casualty List, S. G. O. Official Report of Major General Sheridan. Includes the engagements of the 1st Cavalry Division at Berryville 3d Cavalry Division at Summit, and Sixth Corps at Flowing Springs.
Aug. 21st..	Duval's Bluff, Arkansas	11th Missouri Cavalry	2	2	.....	.....	.....	Official.
Aug. 21st..	Memphis, Tennessee	Detachments of the 8th Iowa, 108th and 113th Illinois, 39th, 40th, and 41st Wisconsin Volunteers, 61st (2d Tennessee) U. S. Colored Troops, 3d and 4th Iowa Cavalry, and Battery G, 1st Missouri Light Artillery.	30	100	30	.....	100†	Report of Adjutant General of Iowa, 1864, p. 1062.
Aug. 21st and 22d.	College Hill, Mississippi	4th Iowa and 11th and 21st Missouri Volunteers, and 3d Iowa and 12th Missouri Cavalry, of the Sixteenth Corps.	.....	.....	.....	15	.....	8	Also designated Oxford Hill and Hurricane Creek.
Aug. 22d..	Canton, Kentucky	.....	.....	.....	.....	.....	.....	.....	
Aug. 22d..	Rodgersville, Tennessee	.....	.....	.....	.....	.....	.....	.....	
Aug. 23d..	Fort Morgan, Alabama	Naval forces under Admiral Farragut	.....	.....	.....	.....	.....	.....	See Mobile Harbor, August 5th to 23d.
Aug. 23d..	Abbeville, Mississippi	10th Missouri, 14th Iowa, 5th and 7th Minnesota, and 8th Wisconsin Volunteers, of Major General A. J. Smith's command.	.....	20	.....	15	.....	8	
Aug. 24th and 25th.	Bermuda Hundred, Virginia	Tenth Corps, Army of the James, Major Gen. Butler	.....	31	.....	.....	.....	61	
Aug. 24th.	Fort Smith, Arkansas	11th U. S. Colored Troops	1	13	2	.....	.....	.....	Official.
Aug. 24th..	Jones's Hay Station and Ashley Station, Long Prairie, Arkansas.	9th Iowa and 8th and 11th Missouri Cavalry	5	41	.....	.....	60	.....	Casualty Return, File F. No. 230, S. G. O. Report of Adjutant General of Iowa, 1867, page 562.
Aug. 24th..	Halltown, Virginia	Portion of the Eighth Corps, Army of the Shenandoah, Major General Crook.	9	37	16	5	25	.....	Casualty List, S. G. O. Official Report of Major General Sheridan.
Aug. 25th..	Smithfield and Shepherdstown, Virginia.	1st Division, Merritt's, and 3d Division, Wilson's, Cavalry, Army of the Potomac.	20	61	160	.....	.....	300*	Casualty List, S. G. O. Official Report of Major General P. H. Sheridan. Also called Kearneysville.
Aug. 25th..	Ream's Station, Virginia	Second Corps, Major General W. S. Hancock, and 2d Division of Cavalry, Gregg's, of the Army of the Potomac, Major General George G. Meade.	127	546	1,769	.....	.....	1,500*	Casualty List, S. G. O. Appendix to Part I. Medical and Surgical History of the War, page 175. Official Report of Major General U. S. Grant.
Aug. 25th..	Conee Creek, Clinton, Louisiana	Portion of the Cavalry of the Department of the Gulf, commanded by General Lee.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Wisconsin, 1864, pages 635 and 653.
Aug. 25th.	Sacramento Mountain, New Mexico	1st New Mexico Cavalry	2	2	.....	.....	.....	.....	Official.
Aug. 26th..	Bull Bayou, Arkansas	9th Kansas and 3d Wisconsin Cavalry	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Wisconsin, 1864, page 622.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Aug. 26th and 27th.	Halltown, Virginia	1st and 2d Divisions, Eighth Corps, Army of West Virginia, Major Gen. G. Crook, of the Army of the Middle Military Division, Major Gen. P. H. Sheridan.	30	141	.....	.....	.....	100*	Appendix to Part I, Medical and Surgical History of the War, page 224. Casualty List, S. G. O.
Aug. 27th.	Owensboro', Kentucky	108th U. S. Colored Troops	3	.....	.....	.....	.....	.....	Official.
Aug. 27th and 28th.	Holly Springs, Mississippi	14th Iowa Volunteers, 11th U. S. Colored Troops (1st Alabama Artillery), and 10th Missouri Cavalry.	1	2	4	.....	.....	.....	
Aug. 28th.	Fort Cottonwood, Nevada Territory	7th Iowa Cavalry	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1865. Fight with Indians.
Aug. 28th.	Howard County, Missouri	Company E, of the 4th Missouri Militia Cavalry	8	.....	1	.....	.....	.....	Report of Adjutant General of Missouri, 1865, page 474.
Aug. 29th.	Ghent, Kentucky	117th U. S. Colored Troops	2	.....	.....	.....	.....	.....	
Aug. 29th.	Smithfield, Virginia	1st Division, Torbett's, Cavalry Corps, and 3d Division, Rickett's, of the Sixth Corps, Army of the Potomac.	10	90	.....	.....	.....	200*	Official Report of Major General P. H. Sheridan. Casualty List, S. G. O. Surgeon W. H. Rullison, Medical Director, was killed.
Aug. 29th.	Wormley's Gap, Virginia	Detachment commanded by Capt. Blazer, 91st Ohio	.....	.....	.....	.....	.....	60*	
Aug. 29th and 30th.	Arthur's Swamp, Virginia	2d Division, Gregg's, of the Cavalry Corps, Army of the Potomac.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O.
Aug. 31st.	Block-house, No. 5, Nashville and Chattanooga Railroad, Tennessee.	115th Ohio Volunteers	3	.....	7	.....	25	.....	Official Report of Major General G. H. Thomas. Ohio in the War, Vol. 2, page 602.
Aug. 31st and Sep. 1st.	Jonesboro', Georgia	Cavalry and Davis's Division, Fourteenth Corps, Major General J. M. Palmer,—Army of the Cumberland, Major General George H. Thomas: Fifteenth Corps, Major General J. A. Logan; Sixteenth Corps, Major General G. M. Dodge; and Seventeenth Corps, Maj. General F. P. Blair,—Army of the Tennessee, Maj. General O. O. Howard;—of the Army of the Military Division of the Mississippi, Maj. Gen. W. T. Sherman.	.....	1,149	.....	.....	.....	2,000	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 299. Official Report of Major General W. T. Sherman. The Confederate Brigadier Generals Anderson, Cummings, and Patten were killed.
May 5th to Sept. 8th.	Campaign in Northern Georgia, from Chattanooga to Atlanta.	Armies of the Cumberland, Tennessee, and Ohio	5,284	26,129	5,786	.....	.....	.....	Appendix to Part I, Medical and Surgical History of the War, page 302. Casualty List, S. G. O.
Sept. 1st to 8th.	Rosseau's pursuit of Wheeler in Tenn.	1st and 4th Tennessee, 2d Michigan, 1st Wisconsin, 8th Iowa, 2d and 8th Indiana, and 6th Kentucky Cavalry, commanded by General Rosseau.	10	30	.....	.....	.....	300*	Casualty List, File A, No. 416, S. G. O. General Kelly, C. S. A., was wounded.
Sept. 1st to Oct. 30th.	Trenches before Petersburg	Army of the Potomac	170	822	812	.....	.....	1,000	Casualty Lists, S. G. O.
Sept. 1st.	Lavergne, Tennessee	Cavalry commanded by General L. H. Rosseau	.....	.....	.....	.....	.....	.....	Included in Rosseau's pursuit of Wheeler, Sept. 1st to 8th.
Sept. 2d.	Occupation of Atlanta, Georgia	Twentieth Corps, Major General Slocum, Army of the Cumberland.	.....	.....	.....	.....	.....	200	Appendix to Part I, Medical and Surgical History of the War, page 309. Official Report of Major General W. T. Sherman.
Sept. 2d.	Franklin, Tennessee	Cavalry commanded by General L. H. Rosseau	.....	.....	.....	.....	.....	.....	Included in Rosseau's pursuit of Wheeler, Sept. 1st to 8th.
Sept. 2d to 6th.	Lovejoy Station, Georgia	Twenty-third Corps, Army of the Ohio, Major General J. M. Schofield, and Fourth Corps, Army of the Cumberland, Major General George H. Thomas,—Army of the Military Division of the Mississippi, Major General W. T. Sherman.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 302. Official reports.

Sept. 2d...	Big Shanty, Georgia.....	9th Ohio Cavalry on a railroad train.....		8	.....	.....	.....	Ohio in the War, Vol. 2, page 813.
Sept. 3d...	Murfreesboro', Tennessee.....	100th U. S. Colored Troops.....	6	.....	.....	.....	.....	Official.
Sept. 3d and 4th.	Berryville, Virginia.....	1st Cavalry Division, Major General Torbett, Army of the Potomac; Eighth Corps, Army of Western Virginia, Major General G. Crook, and Nineteenth Corps, Major General Emory,—Army of the Middle Military Division, Major General P. H. Sheridan.	30	182	100	25	100	70	Casualty List, S. G. O. Official Report of Major General P. H. Sheridan.
Sept. 3d...	Darkesville, Virginia.....	3d Cavalry Division, Army of the Potomac.....	.....	.....	50*	.....	.....	50*	Casualty List, S. G. O.
Sept. 4th..	Greenville, Tennessee.....	9th and 13th Tennessee, and 10th Michigan Cavalry, commanded by General Gillem.	.....	6	7	10	60	75	Report of Adjutant General of Tennessee, 1866, page 637. The Confederate General John Morgan, was killed.
Sept. 5th..	Campbellville, Tennessee	Cavalry commanded by General L. H. Rosseau.....	.....	.....	.....	.....	.....	.....	Included in Rosseau's pursuit of Wheeler, Sept. 1st to 8th.
Sept. 6th...	Searcy, Arkansas.....	Detachment of the 9th Iowa Cavalry.....	2	6	10	.....	.....	.....	Report of Adjutant General of Iowa, 1867, p. 562.
Sept. 7th..	Readyville, Tennessee.....	Detachment of the 9th Pennsylvania Cavalry.....	.....	.....	.....	.....	.....	130	
Sept. 7th..	Dutch Gap, Virginia.....	4th U. S. Colored Troops.....	5	4	.....	.....	.....	.....	
Sept. 10th.	Capture of Fort Hell, Jerusalem Plank Road, Virginia.	99th Pennsylvania, 2d U. S. Sharp-Shooters, and 20th Indiana Volunteers.	.....	20	.....	.....	.....	90	Casualty Lists, S. G. O.
Sept. 13th.	Lock's Ford, Opequan, Virginia.....	2d Brigade, Brigadier General McIntosh, 3d Division, Wilson's, Cavalry Corps, Major General Torbett's,—Army of the Middle Military Division, Major Gen. P. H. Sheridan.	2	18	.....	.....	.....	161	Official Report of Major General P. H. Sheridan. Casualty Lists, S. G. O.
Sept. ——	Near Pine Bluff, Arkansas.....	Two companies of the 1st Indiana Cavalry.....	.....	8	.....	.....	.....	.....	Report of Adjutant General of Indiana, Vol. II, page 278.
Sept. 16th and 18th.	Fort Gibson, Indian Territory.....	79th U. S. Colored Troops (1st Kansas) and 2d Kansas Cavalry.	38	.....	48	.....	.....	.....	Official.
Sept. 16th.	Sycamore Church, Virginia.....	1st District of Columbia and 13th Pennsylvania Cavalry, guarding cattle.	.....	.....	400*	.....	.....	50*	Report of Adjutant General of Maine, 1864, p. 297.
Sept. 17th..	Fairfax Station, Virginia	13th and 16th New York Cavalry.....	.....	41	.....	.....	.....	.....	Partizan Life with Mosby.
Sept. 17th.	Belcher's Mills, Virginia.....	Kautz's Cavalry of the Army of the James, and the 2d Cavalry Division, Gregg's, Army of the Potomac.	.....	25	.....	.....	.....	.....	Appendix to Part I, Medical and Surgical History of the War, page 196.
Sept. 17th to 20th.	Doniphan and Black River, Missouri....	One company of the 3d Missouri Militia Cavalry.....	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Missouri, 1865, Page 467.
Sept. 18th.	Martinsburg, Virginia.....	2d Division of Cavalry, Averill's, of the Army of West Virginia, Middle Military Division.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O.
Sept. 18th.	Fort Cottonwood, Nevada Territory.....	7th Iowa Cavalry	.....	3	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1865, p. 143.
Sept. 19th.	Opequan, Winchester, Virginia.....	Eighth Corps, Major General G. Crook, and 2d Division, Cavalry, Brigadier General Averill, of the Army of West Virginia; Sixth Corps, Major General H. G. Wright, and 1st and 3d Divisions, Cavalry, Major General F. H. Torbett, Army of the Potomac; 1st and 2d Divisions, Nineteenth Corps, Major General Emory,—Army of the Middle Military Division Major General P. H. Sheridan.	653	3,719	618	.....	3,000†	2,500	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 223. Official Report of Major General P. H. Sheridan. Also designated Belle Grove. Among the casualties in the Union army were Brigadier General D. A. Russell and Colonel James A. Mulligan, killed. and Brigadier Generals McIntosh, Upton, and Chapman, wounded. In the Confederate army, Major General Rhodes, Brigadier Generals Gordon and Goodwin, were killed, and Fitz-Hugh Lee, Terry, Johnson, and Wharton, wounded.
Sept. 19th.	Cabin Creek, Indian Territory.....	2d, 6th, and 14th Kansas Cavalry, and 1st and 2d Kansas Indian Home Guards.	7	6	4	.....	.....	.....	

*Killed, wounded, and missing. †Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Sept. 21st..	Front Royal Pike, Virginia	3d Division, Wilson's, Cavalry Corps, of the Army of the Potomac.	.....	.....	.....	.....	.....	.....	Official Report of Major General P. H. Sheridan, commanding Army of the Middle Military Division.
Sept. 22d .	Fisher's Hill, Virginia	Sixth Corps, Major General H. G. Wright; 1st and 2d Divisions, Cavalry, Major General F. H. Torbett, of the Army of the Potomac; Eighth Corps, Major Gen. G. Crook, of the Army of West Virginia; 1st and 2d Divisions, Nineteenth Corps, Maj. General Emory,—Army of the Middle Military Division, Major Gen. P. H. Sheridan.	40	314	5	.....	250†	1,100	Casualty List. S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 223. Official Report of Major General P. H. Sheridan. Also designated Woodstock.
Sept. 23d..	Athens, Alabama	106th, 110th, and 114th U. S. Colored Troops, 3d Tennessee Cavalry, garrisoning the Post, and 18th Michigan and 102d Ohio Volunteers, reinforcements.	.....	.....	950	5	25	.....	Official Reports of Generals G. H. Thomas, U. S. A., and N. B. Forrest, C. S. A.
Sept. 23d..	Rockport, Missouri	2d Missouri Militia Cavalry	10	.....	1	.....	.....	.....	Official.
Sept. 23d..	Blackwater, Missouri	One battalion of the 1st Missouri Militia Cavalry	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Missouri, 1865, page 448.
Sept. 24th.	Luray, Virginia	1st Division, Merritt's, Cavalry Corps, Army of the Potomac.	.....	.....	.....	.....	.....	74	Official Report of Major General P. H. Sheridan, commanding Army of the Middle Military Division.
Sept. 24th.	Fayette Missouri	9th Missouri Militia Cavalry	3	5	.....	6	30	.....	Report of Adjutant General of Missouri, 1865, page 512.
Sept. 24th.	Bull's Gap, Tennessee	Cavalry and Mounted Infantry, commanded by Gen. Ammen.	.....	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 609.
Sept. 24th to Oct. 28th.	Price's invasion of Missouri	Missouri Militia Cavalry and Cavalry of General A. J. Smith's command, commanded by Gen. Pleasanton; Kansas Militia and Cavalry of the Army of the Border, commanded by General Curtis.	170	336	.....	.....	.....	.....	Official Reports of Major General W. S. Rosecrans. See engagements at Pilot Knob, Sept. 26th; Centralia, Sept. 27th; Leesburg, Sept. 30th; Osage, Oct. 6th; Jefferson City, Oct. 7th; Boonesville, Oct. 9th; Glasgow and Sedalia, Oct. 15th; Lexington, Oct. 19th; Little Blue, Oct. 21st; Independence, Oct. 22d; Big Blue, Oct. 23d; Little Osage, Oct. 25th; and Newtonia, Oct. 28th.
Sept. 25th .	Sulphur Branch Trestle, Alabama	111th U. S. Colored Troops (3d Tennessee), and 9th Indiana Cavalry.	12	11	.....	.....	.....	.....	Official Report of Major General G. H. Thomas.
Sept. 25th..	Johnsonville, Tennessee	13th U. S. Colored Troops	3	1	.....	.....	.....	.....	Official.
Sept. 25th..	Henderson, Kentucky	118th U. S. Colored Troops	.....	.....	.....	.....	.....	.....	
Sept. 26th..	Vache Grass, Arkansas	14th Kansas Cavalry	8	2	4	.....	.....	.....	Official.
Sept. 26th and 27th.	Fort Davidson, Pilot Knob, Missouri	47th and 50th Missouri, and 14th Iowa Volunteers, 2d and 3d Missouri Cavalry, and Battery H, 2d Missouri Light Artillery.	28	56	100	.....	1,500	.....	Official Report of Brigadier General T. Ewing, commanding. Also designated Ironton.
Sept. 26th.	Brown's Gap, Virginia	1st Division of Cavalry, of the Army of the Potomac, and 2d Division, Cavalry, of the Army of West Va.	.....	.....	25*	.....	.....	30*	Official Report of Major General Sheridan.
Sept. 26th..	Richland, Tennessee	111th U. S. Colored Troops (3d Alabama)	.....	.....	.....	.....	.....	.....	
Sept. 27th.	Weyer's Cave, Virginia	2d Division, Cavalry, Army of West Virginia	.....	.....	50*	.....	.....	30*	

Sept. 27th.	Pulaski, Tennessee	Cavalry commanded by Major General Rosseau							Official Report of Major General Thomas.
Sept. 27th.	Massacre on North Missouri Railroad	Furloughed soldiers		22		5			Official Report of Major General Rosecrans.
Sept. 27th.	Massacre at Centralia, Missouri	Three companies of the 39th Missouri Volunteers		122		2			Official Report of Major General Rosecrans.
Sept. 27th.	Carter's Station, Watauga River, Ark.	Cavalry and Mounted Infantry, commanded by Gen. Ammen.							Ohio in the War, Vol. 2, page 609.
Sept. 27th.	Marianna, Florida	82d U. S. Colored Troops, 7th Vermont Volunteers, and 2d Maine Cavalry, commanded by Brigadier General A. Asboth.			32			81	Official Report of Major General E. R. S. Canby. Brigadier General Asboth, wounded.
Sept. 27th.	Fort Rice, Dakota Territory	Detachment of the 6th Iowa Cavalry							Engagements with Indians.
Sept. 28th.	Clarksville, Arkansas	3d Wisconsin Cavalry							
Sept. 28th.	Waynesboro', Virginia	3d Division, Wilson's, Cavalry Corps, of the Army of the Potomac.							Official Report of Major General Sheridan, commanding Army of the Middle Military Division.
Sept. 28th to 30th.	New Market Heights, Virginia	Tenth Corps, Major General Birney; Eighteenth Corps, Major General Ord; and Cavalry, Brigadier General Kautz,—of the Army of the James, Major General B. F. Butler.		400	2,029			2,000*	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 175. Official Report of Major General U. S. Grant. Also designated Chapin's Farm, Laurel Hill, and Forts Harrison and Gilmore. Among the casualties were General Burnham, killed, and Major Generals Ord and Stannard, wounded.
Sept. 28th.	Fort Sedgwick, Jerusalem Plank Road, Virginia.	3d Division, Ninth Corps							
Sept. 29th.	Centreville, Tennessee	2d Tennessee Mounted Infantry		10	25				Report of Adjutant General of Tennessee,
Sept. 29th and 30th.	Leesburg and Harrison, Missouri	2d Missouri Militia Cavalry, Battery H, 2d Missouri Light Artillery, and 14th Iowa Volunteers.							Official Report of Major General T. Ewing.
Sept. 30th to Oct. 1st.	Preble's Farm, Poplar Springs Church, Virginia.	1st Division, Wilcox's, Fifth Corps, and 2d Division, Potter's, of the Ninth Corps.		141	788	1,756		800	100	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 175. Official Report of Major General U. S. Grant.
Sept. 30th to Oct. 1st.	Arthur's Swamp, Virginia	2d Cavalry Division, Gregg's, of the Army of the Potomac.			60	100				Casualty List, S. G. O.
Oct. 1st and 2d.	Athens, Alabama	73d Indiana Volunteers								Official Report of Major General Thomas.
Oct. 1st.	Huntsville, Alabama	Detachments of the 12th and 13th Indiana Cavalry								Report of Adjutant General of Indiana, Vol. III, page 267.
Oct. 1st.	Franklin, Missouri	Enrolled Missouri Militia, commanded by Col. Wolfe								Official Report of Major General Rosecrans.
Oct. 1st.	Reconnoissance on Charles City Cross Roads, Virginia.	Spear's Cavalry Brigade, and Terry's Brigade, Tenth Corps, Army of the James.								Army and Navy Journal. Vol. I, page 99.
Oct. 1st to 5th.	Yellow Tavern, Weldon Railroad, Va.	3d Division, Second Corps, of the Army of the Potomac								Casualty List, S. G. O.
Oct. 1st to 3d.	Sweetwater, Noses, and Powder Spring Creeks, Georgia.	Kilpatrick's Cavalry, of the Army of the Cumberland								Official Report of Major General Sherman.
Oct. 2d.	Waynesboro', Virginia	Portion of the 1st Division, Merritt's, and 3d Division, Custer's, Cavalry Corps, Army of the Potomac.				50*				
Oct. 2d.	Saltville, Virginia	11th and 13th Kentucky, 12th Ohio, 11th Michigan, and 5th and 6th U. S. Colored Cavalry, and 26th, 30th, 35th, 37th, 39th, 40th, and 45th Kentucky Mounted Infantry.		54	190	104	18	71	21	Official Report of Major General S. G. Burbridge, commanding. Appendix to Part I, Medical and Surgical History of the War, page 228.
Oct. 2d.	Gladesville, Pound Gap, Virginia	1st Kentucky Cavalry and 3d Kentucky Mounted Infantry.								Official Report of Major General S. G. Burbridge.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Oct. 4th...	Near Memphis, Tennessee	One company of the 7th Indiana Cavalry	7						Report of Adjutant General of Indiana, Vol. III, page 218.
Oct. 5th...	Jackson, Louisiana	23d Wisconsin Volunteers, 1st Texas, and 1st Louisiana Cavalry, and 2d and 4th Massachusetts Batteries.	4	10				47	Official Report of Major General Canby.
Oct. 5th...	Allatoona, Georgia	7th, 12th, 50th, 57th, and 93d Illinois, 39th Iowa, 4th Minnesota, and 18th Wisconsin Volunteers, and 12th Wisconsin Battery.	142	352	212	231	500	411	Casualty List, File A, S. G. O. Official reports. Brigadier General J. M. Corse, commanding the Nationals, was wounded.
Oct. 5th...	Fort Adams, Louisiana	2d Wisconsin and 3d U. S. Colored Cavalry							
Oct. 6th...	Florence, Alabama	60th Illinois Volunteers and 8th Iowa and 6th Tennessee Cavalry.							
Oct. ——	North Shenandoah, Virginia	8th Ohio Cavalry							Official Dispatch of Major General Sheridan.
Oct. 6th...	Prince's Place, Osage River, Cole Co., Missouri.	1st, 7th, and 9th Missouri Militia Cavalry, commanded by Colonel Philips.							Official Report of Major General Rosecrans.
Oct. 6th...	Woodville, Mississippi						40	56	Official Report of Major General Canby.
Oct. 7th...	New Market, Virginia	3d Division, Custer's, Cavalry of the Army of the Potomac.			56				Confederate reports.
Oct. 7th...	Darbytown Roads, near New Market Heights, Virginia.	Tenth Corps, Major General Birney, and Cavalry, Brigadier General Kautz, of the Army of the James, Major General B. F. Butler.	50	199	150		1,000	350	Official Reports of Major General Grant. Among the casualties were General Gregg, C. S. A., killed, and Bratton wounded. Colonel Spear, U. S. V., was wounded.
Oct. 7th...	Moreau Bottom, near Jefferson City, Missouri.	Missouri Militia, Cavalry, Artillery, and Infantry, commanded by Generals Fisk, Brown, McNeil, and Sanborn.							Official Report of Major General Rosecrans.
Oct. 8th...	Reconnoissance to the Boydtown Plank Road, Virginia.	Fifth and Ninth Corps of the Army of the Potomac		50					Casualty List, S. G. O.
Oct. 9th...	Tom's Brook, Virginia	1st Division, Merritt's, and 3d Division, Custer's, Cavalry Corps, Torbett's, of the Army of the Potomac,—Middle Military Division, Major General Sheridan.	9	67			100†	180	Official Report of Major General Sheridan. Also designated Fisher's Hill, Strasburg, and Woodstock. Appendix to Part I, Medical and Surgical History of the War, page 225.
Oct. 9th...	California, Missouri	4th and 7th Missouri Militia Cavalry and Batteries H and L, 2d Missouri Artillery.							Report of Adjutant General of Missouri, 1865, p. 474. Official Report of Major Gen. Rosecrans.
Oct. 9th to 11th.	Boonsville, Missouri	1st, 4th, 5th, 6th, and 7th Missouri Militia Cavalry, 15th Missouri and 17th Illinois Cavalry, and Battery H, 2d Missouri Light Artillery, commanded by Gen. Sanborn.							Official Report of Major General Rosecrans.
Oct. 10th..	South Tunnel, Tennessee	40th U. S. Colored Troops	4						Official.
Oct. 10th..	East Point, Mississippi	61st U. S. Colored Troops (2d Tennessee)	16	20	5				Official.
Oct. 11th..	Fort Donelson, Tennessee	Portion of the 4th U. S. Colored Heavy Artillery, commanded by Colonel Weaver.	4	9		3	23		Official.
Oct. 11th..	Stony Creek Station, Virginia	13th Pennsylvania Cavalry						14	
Oct. 11th..	Narrows, Georgia	Garrard's Cavalry Division, Army of the Cumberland							Official Report of Major General Sherman.

Oct. 12th.	Greenville, Tennessee								
Oct. 12th.	Resaca, Georgia	Garrison, commanded by Colonel Weaver							Official Reports of Major Generals Sherman and Thomas.
Oct. 13th.	Reconnoissanee to Strasburg, Virginia	1st and 2d Divisions, Nineteenth Corps, Major General Emory, and 1st and 2d Divisions, Army of West Virginia, Major General Crook,—Army of the Middle Military Division.	30	144	40				Official Report of General Sheridan. Brevet Brig. General G. D. Wells was killed.
Oct. 13th.	Tilton, Georgia								Official.
Oct. 13th.	Dalton, Georgia	Troops commanded by Colonel Johnson, 44th U. S. Colored Troops.			400				Official Report of Major General Thomas.
Oct. 13th.	Buzzard Roost Block-House, Georgia	One company of the 115th Illinois Volunteers	5	36	60				Report of Adjutant General of Illinois, Vol. II, page 524.
Oct. 13th.	Reconnoissanee, Darbytown Road, Va.	1st and 3d Divisions, Tenth Corps, Major General Terry, and Kautz's Cavalry Division, of the Army of the James.	55	303	56		100		Official Report of Major General Grant.
Oct. 15th.	Bayou Biddell, Louisiana	52d U. S. Colored Troops (2d Mississippi)	1	2					
Oct. 15th.	Glasgow, Missouri	43d Missouri Volunteers, detachments of the 17th Illinois, 9th Missouri Militia, and 13th Missouri Cavalry, and 62d U. S. Colored Troops (1st Missouri), commanded by Colonel Harding.			400		50†		Official Report of Major General Rosecrans. Report of Adjutant General of Missouri, 1865, p. 385. Casualty Return, File F, No. 158, S. G. O.
Oct. 15th.	Snake Creek Gap, Georgia	Portion of the Army of Tennessee							Official Report of Major General Sherman.
Oct. 15th.	Sedalia, Missouri	1st and 7th Missouri Militia Cavalry	1		23				Official Report of Major General Rosecrans.
Oct. 16th.	Ship's Gap, Taylor's Ridge, Georgia	1st Division, Fifteenth Corps						40	Official Report of Major General Sherman.
Oct. 17th.	Cedar Run Church, Virginia	Detachment of the 1st Connecticut Cavalry			25				Official Report of Major General Torbett.
Oct. 18th.	Pierce's Point, Blackwater, Florida	19th Iowa Volunteers and 2d Maine and 1st Florida Cavalry.							Report of Adjutant General of Iowa, 1865, p. 285.
Oct. 19th.	Lexington, Missouri	3d Wisconsin and 5th, 11th, 15th, and 16th Kansas Cavalry, commanded by General Blunt, of General Curtis's Army.							Official Report of Major General Rosecrans.
Oct. 19th.	Cedar Creek, Virginia	1st Division, Merritt's, and 3d Division, Custer's, Cavalry Corps, Major General Torbett, and Sixth Corps, Major General Wright, of the Army of the Potomac; Eighth Corps, Crook's, and Cavalry, of the Army of West Virginia; and 1st and 2d Divisions, Nineteenth Corps, Major General Emory,—Army of the Middle Military Division, Major Gen. Sheridan.	588	3,516	1,891		3,000†	1,200	Official Report of Major General Sheridan, Appendix to Part I, Medical and Surgical History of the War, page 225. Casualty List, S. G. O. Also designated Middletown. Among the casualties in the Union army were Brigadier Generals Bidwell and Thorburn, killed; Major Generals Wright, Ricketts, and Grover, and Acting Brigadier Generals Kitchen, McKenzie, Penrose, Hamlin, Devins, Duval, and Lowell, wounded. In the Confederate army Major Gen. Ramseur was killed, and Major Generals Battle and Connor, wounded.
Oct. 20th to 26th.	Fort Leavenworth, Kansas			77					Casualty Return, S. G. O.
Oct. 20th.	Little River, Tennessee	Cavalry and a portion of the Fifteenth Corps							Official.
Oct. 21st.	Harrodsburgh, Kentucky	5th U. S. Colored Cavalry							Official.
Oct. 21st.	Little Blue, Missouri	2d Colorado, 3d Wisconsin, 5th, 11th, 15th, and 16th Kansas Cavalry, and one brigade of Kansas militia of General Curtis's Army, 2d and 5th Missouri Militia, and two battalions of the 2d Missouri Artillery.—advance of General Pleasanton's Cavalry.							Official Report of Major General Rosecrans. Report of Adjutant General of Kansas. Two engagements, one between General Price's vanguard and General Curtis's troops, and the other between General Price's rear and the advance of General Pleasanton.

† Killed and wounded.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS. Killed.	Wounded.	Missing.	CONFED. LOSS. Killed.	Wounded.	Missing.	REMARKS AND REFERENCES.
Oct. 22d..	Independence, Missouri	2d Colorado and 5th, 7th, 11th, 15th, and 16th Kansas Cavalry, and Kansas Militia, of General Curtis's command, and 1st, 2d, 4th, 6th, 7th, 8th, and 9th Missouri Militia Cavaly, 13th Missouri, 3d Iowa, and 17th Illinois Cavalry, of General Pleasanton's command.	.....	.....	.....	40	.....	100§	Official Report of Major General Rosecrans. Two engagements, one between Price's advance and Curtis's troops, and the other between Price's rear-guard and Pleasanton's advance.
Oct. 22d..	White River, Arkansas	53d U. S. Colored Troops	2	1	.....	.....	.....	.....	Official.
Oct. 22d...	Gunboat attack on the Union batteries on the James River, Virginia.	.....	.....	.....	.....	.....	11	.....	
Oct. 23d...	Hurricane Creek, Mississippi	1st Iowa and 9th Kansas Cavalry	1	2	.....	.....	.....	.....	Official.
Oct. 23d...	Princeton, Arkansas	3d Missouri Cavalry	3	.....	.....	.....	.....	.....	Official.
Oct. 23d...	Westport, Big Blue, Missouri	Missouri Militia Cavalry, and Cavalry of General A. J. Smith's command, commanded by Major General A. Pleasanton, and Cavalry and Kansas Militia of the Army of the Border, commanded by General Curtis.	.....	.....	.....	.....	.....	.....	Casualty List, File A, No. 525, S. G. O. Official Report of Major General Rosecrans.
Oct. 24th.	Coldwater Grove, Osage, Missouri	Kansas Cavalry, of Gen. Curtis's Army of the Border	.....	.....	.....	.....	.....	.....	
Oct. 25th..	Mine Creek, Maria Des Cygnes, and Little Osage River, Kansas.	Cavalry of Generals Pleasanton's and Curtis's armies	.....	.....	.....	.....	.....	.....	Official Report of Major General Rosecrans. Pursuit of Price's forces.
Oct. 26th..	Milton, Blackwater, Florida	19th Iowa Volunteers and 2d Maine Cavalry	.....	.....	.....	.....	.....	.....	Official Report of Lieutenant Colonel Sparling.
Oct. 26th to 29th.	Decatur, Alabama	18th Michigan, 102d Ohio, and 68th Indiana Volunteers, and 14th U. S. Colored Troops.	10	45	100	100	300	50	Official Report of Major General Thomas.
Oct. 27th..	Hatcher's Run, South-Side Railroad, Virginia.	2d Cavalry Division, Gregg's; 2d and 3d Divisions, Second Corps, Major General Hancock; Fifth Corps, Major General Warren; and Ninth Corps, Major General Parke,—Army of the Potomac, Major Gen. Meade.	156	1,047	699	200	600	200	Official Report of Major General Grant. Appendix to Part I, Medical and Surgical History of the War, page 176. Casualty List, S. G. O. Also designated Boydtown Road, Vaughn Road, and Burgess Farm.
Oct. 27th and 28th.	Fair Oaks, near Richmond, Virginia	Tenth Corps, Major General Terry; Eighteenth Corps, Major General Weitzel; and Cavalry, Brig. General Kautz,—Army of the James, Major General Butler,	120	783	400	60	311	80	Official Report of Major General U. S. Grant. Casualty List, S. G. O.
Oct. 28th and 30th.	Newtonia, Missouri	Cavalry of the Army of the Border, commanded by Gen. Blunt.	.....	.....	.....	.....	250	.....	Official Report of Major General Rosecrans. Pursuit of Price's forces.
Oct. 28th..	Fort Heiman, Tennessee	Union gunboats	.....	.....	.....	.....	.....	.....	Official.
Oct. 28th..	Destruction of the rebel ram Albemarle.	Thirteen men, commanded by Lieut. W. B. Cushing, U. S. N.	.....	3	11	.....	.....	.....	Official report.
Oct. 28th..	Fayetteville, Arkansas	1st Arkansas Cavalry	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Arkansas.
Oct. 28th..	Morristown, Tennessee	Cavalry, commanded by General Gillem	8	42	.....	.....	.....	240	
Oct. 29th..	Beverly, West Virginia	8th Ohio Cavalry	8	25	13	17	27	92	Ohio in the War, Vol. 2, page 806.
Oct. 30th..	Musele Shoals, Raccoon Ford, Alabama.	1st Brigade, 1st Cavalry Division, Army of the Cumberland.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1867, p. 553.
Oct. 30th..	Ladija, Terrapin Creek, Alabama	Garrard's Division of Cavalry of the Army of the Cumberland.	.....	.....	.....	.....	.....	.....	
Oct. 30th..	Near Brownsville, Arkansas	7th Iowa and 11th Missouri Cavalry	2	.....	4	.....	.....	.....	Report of Adjutant General of Iowa, 1867, p. 563.

Oct. 31st...	Plymouth, North Carolina.....	U. S. steamers Commodore Hull, Shamrock, Otsego. Wyalusing, and Tacony.	.....	.....	.....	.....	.....	37	Official Report of Commodore W. H. Macomb, U. S. N.
Nov. 1st...	Black River, Louisiana.....	6th U. S. Colored Heavy Artillery.....	6	.....	.....	.....	.....	.....	Official.
Nov. 1st to 4th.	Union Station, Tennessee	10th Missouri Cavalry.....	2	2	26	.....	.....	.....	Official.
Nov. 3d...	Vera Cruz, Arkansas.....	One company of the 46th Missouri Vols. (six-months').....	5	1	.....	.....	.....	.....	Official.
Nov. 4th and 5th.	Johnsonville, Tennessee.....	11th. Tennessee Cavalry, 43d Wisconsin Volunteers, and 12th U. S. Colored Troops.	.....	.....	.....	.....	.....	.....	Official Report of Major General Thomas.
Nov. 5th and 6th.	Big Pigeon River, Tennessee.....	3d North Carolina Mounted Infantry, Colonel Kirk.....	.....	2	.....	.....	.....	.....	Casualty Return, S. G. O.
Nov. 5th...	Fort Sedgwick, Virginia	Second Corps, Army of the Potomac.....	5	10	5	15	35	41	Also known as Fort Hell.
Nov. 9th...	Atlanta, Georgia.....	2d Division, Twentieth Corps, Army of the Cumberland.	.....	.....	.....	.....	.....	20*	Official Report of Brig. General A. S. Williams.
Nov. 9th...	Shoal Creek, Alabama	5th Division, Cavalry, Brigadier General Hatch, of General Thomas' Army.	.....	.....	.....	.....	.....	.....	Official Report of Major General Thomas.
Nov. 12th..	Newtown, Ninevah, and Cedar Springs, Virginia.	1st Division, Merritt's, and 3d Division, Custer's, Cavalry of the Army of the Potomac, and 2d Division, Powell's, Cavalry of the Army of West Virginia.	.....	84	100	.....	.....	150	Official Report of Major General Torbett. List of casualties, S G. O.
Nov. 13th..	Bull's Gap, Morristown, Tennessee.....	8th, 9th, and 13th Tennessee Cavalry, commanded by General Gillem.	5	36	200	.....	.....	.....	Appendix to Part I, Medical and Surgical History of the War. page 326. Official Report of Major General Thomas.
Nov. 14th to 28th.	Cow Creek, Kansas	54th U. S. Colored Troops (2d Arkansas) and 3d Kansas Indian Home Guards.	4	.....	.....	.....	.....	.....	Official.
Nov. 15th..	Clinton and Liberty Creek, Louisiana ...	Expedition commanded by General A. L. Lee.....	.....	.....	.....	.....	.....	69	Report of Adjutant General of Wisconsin, 1863, page 636.
Nov. 16th..	Lovejoy Station, Jonesboro', Georgia ...	1st Brigade, 3d Division, Cavalry, Kilpatrick's, of the Army of the Cumberland.	.....	.....	.....	.....	.....	50	Official Report of Brigadier General Kilpatrick.
Nov. 16th..	Bear Creek Station, Georgia.....	2d Brigade, 3d Division, Cavalry, Kilpatrick's, of the Army of the Cumberland.	.....	.....	.....	.....	.....	.....	Official Report of Brigadier General Kilpatrick.
Nov. 17th..	Chester Station, Bermuda Hundred, Va..	209th Pennsylvania Volunteers	.....	10	120	.....	10	.....	
Nov. 17th..	Aberdeen and Butler Creek, Alabama ..	2d Iowa Cavalry.....	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1864, p. 1323.
Nov. 18th..	Myerstown, Virginia.....	Detachment, commanded by Captain R. Blazer, 91st Ohio.	.....	.....	60*	.....	.....	10*	Partizan Life with Mosby, page 267.
Nov. 19th..	Bayou La Fouche, or Ash Bayou, La....	11th Wisconsin Volunteers and 93d U. S. Colored Troops.	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Wisconsin, 1865, page 188.
Nov. 20th..	Macon, Georgia.....	10th Ohio and 9th Pennsylvania Cavalry, 92d Illinois Mounted Infantry, and 10th Wisconsin Battery, of the 3d Division Cavalry,—Army of the Cumberland.	.....	.....	.....	.....	.....	.....	Official Report of Brigadier General Kilpatrick.
Nov. 21st..	Liberty and Jackson, Louisiana	4th Wisconsin Cavalry and 1st Wisconsin Battery.....	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Wisconsin, 1865, page 636.
Nov. 22d..	Rolling Fork, Mississippi.....	3d U. S. Colored Cavalry (1st Mississippi).....	.....	.....	.....	.....	.....	.....	
Nov. 22d..	Griswoldville, Georgia.....	Walcott's Brigade, 1st Division, Fifteenth Corps, and 1st Brigade, 3d Division of Cavalry,—Army of the Tennessee.	10	52	.....	50	200	400	Official Report of Major General Sherman. Gen. Walcott, U. S. V., and Gen. Anderson, C. S. A., were wounded.
Nov. 22d..	Clinton, Georgia.....	Advance of the Fifteenth Corps	.....	.....	.....	.....	.....	.....	Official.

* Killed, wounded, and missing. § Wounded and missing.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed[1]	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Nov. 22d..	Rood's Hill, Virginia.....	1st and 3d Divisions, Cavalry Corps, Army of the Potomac, and 2d Division of Cavalry of the Army of West Virginia, Major General Torbett.	18	52	10	.....	.....	.....	Casualty List, S. G. O.
Nov. 22d..	Lawrenceburg, Tennessee.....	5th Division, Cavalry, of the Military Division of the Mississippi, Brigadier General Hatch.	.....	.....	50*	.....	.....	50*	Official Report of Major General Thomas.
Nov. 24th..	Bent's Old Fork, Texas.....	1st California Cavalry.....	.....	10	2	.....	.....	.....	Official.
Nov. 24th..	Campbellville and Lynnville, Tenn.....	5th Division, Cavalry, Brigadier General Hatch.....	.....	25	.....	.....	.....	.....	Official Report of Major General Thomas.
Nov. 24th to 28th.	Columbia, Duck Run, Tennessee.....	Capron's Brigade, 1st Division, Cavalry, and Fourth and Twenty-third Corps of General Thomas's Army.	.....	.....	.....	.....	.....	.....	Official Report of Major General Thomas.
Nov. 24th and 25th.	Ball's Ferry, Oconee River, Georgia....	1st Alabama Cavalry, advance of the Army of the Tennessee, Major General O. O. Howard.	.....	.....	.....	.....	.....	.....	Official Report of Major General O. O. Howard.
Nov. 25th..	Pawnee Forks, Kansas.....	One company of the 1st Colorado Cavalry.....	1	5	.....	.....	.....	.....	Official.
Nov. 25th..	St. Vrain's Old Fort, New Mexico	One company of the 1st New Mexico Cavalry.....	.....	2	.....	.....	.....	.....	
Nov. 26th..	Madison Station, Alabama.....	101st U. S. Colored Troops	5	.....	.....	.....	.....	.....	Official.
Nov. 26th..	Sandersville, Georgia.....	3d Brigade, 1st Division, Twentieth Corps.....	.....	.....	100	.....	.....	100	Official Report of Major General Sherman. Also designated Buffalo Creek.
Nov. 26th..	Sylvan Grove, Georgia.....	8th Indiana and 2d Kentucky, of the 1st Brigade, 3d Division, Cavalry, Major General Kilpatrick.	.....	.....	.....	.....	.....	.....	Official Report of Colonel E. H. Murray, commanding brigade.
Nov. 27th..	Big Black River Bridge, Mississippi Central Railroad.	Cavalry and Artillery, commanded by Colonel E. D. Osband, 3d U. S. Colored Cavalry.	.....	.....	.....	.....	.....	.....	
Nov. 27th to 29th.	Waynesboro', Thomas Station, and Buck Head Creek.	3d Cavalry Division, Army of the Military Division of the Mississippi, Major General Kilpatrick.	.....	46	.....	.....	.....	600*	Official Report of Major General Sherman. Also designated Reynold's Plantation, Jones' Plantation, and Browne's Cross Roads.
Nov. 28th..	Fort Kelly, New Creek, West Virginia..	.....	.....	.....	700	2	3	.....	Official Report of Lieutenant General R. E. Lee, C. S. A.
Nov. 29th..	Spring Hill, Tennessee.....	Fourth Corps, Major General Stanley, and Cavalry.....	.....	.....	.....	.....	.....	.....	Official Report of Major General Thomas. Also designated Mount Carmel.
Nov. 29th..	Big Sandy, Colorado Territory.....	1st and 3d Colorado Cavalry.....	3	21	.....	.....	.....	.....	Official.
Nov. 30th..	Franklin, Tennessee.....	Fourth Corps, Major General Stanley, of the Army of the Cumberland; Twenty-third Corps, Major Gen. Cox, of the Army of the Ohio, commanded by Maj. General Schofield.	189	1,033	1,104	1,750	3,800	702	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 323. Official Reports of Major General G. H. Thomas, U. S. A., and Lieutenant General Hood, C. S. A. Among the casualties were Major Generals Stanley and Bradley, U. S. A., wounded, and Major General Cleborne, Brigadier Generals Adams, John Williams, Strahl, Geist, and Granberry, killed, and Major General J. Brown, Brig. Generals S. Carter, Manigault, Quarles, Cockerelle, and Scott, C. S. A., wounded.
Nov. 30th..	Honey Hill, Broad River, South Carolina.	25th Ohio, 56th and 155th New York Volunteers, and 26th, 32d, 35th, and 102d U. S. Colored Troops, and 54th and 55th Massachusetts Colored Troops, of the Army of the South, commanded by Brig. Gen. Hatch.	66	645	.....	.....	.....	.....	Casualty Return, S. G. O. Also designated Grahamsville.

Nov. 30th to Dec. 4th.	Bermuda Hundred, Virginia	Pickets of the 20th Colored Troops	25						
Dec. 1st	Stoney Creek Station and Duvall's Mills, Weldon Railroad, Virginia.	2d Division, Gregg's, Cavalry, of the Army of the Potomac.		40				175	Casualty List, S. G. O. Official dispatches.
Dec. 1st	Twelve miles from Yazoo City, Miss	Detachment of the 2d Wisconsin Cavalry	5	9	25				Report of Adjutant General of Wisconsin, 1865, page 608.
Dec. 1st to 31st.	Trenches before Petersburg, Virginia	Army of the Potomac	40	329					Casualty List, S. G. O.
Dec. 1st to 14th.	Skirmishing in front of Nashville, Tenn.	Fourth Corps, Major General Wood, of the Army of the Cumberland; Twenty-third Corps, Major Gen. Schofield, Army of the Ohio; and 1st and 3d Divisions, of the Sixteenth Corps, Major Gen. A. J. Smith, Army of the Tennessee, and Cavalry, commanded by Major General Wilson.	16	100					Official Report of Major General Thomas. Appendix to Part 1, Medical and Surgical History of the War, page 323. Casualty List, S. G. O.
Dec. 1st	Millen Grove, Georgia	5th Kentucky and 8th Indiana Cavalry, of Sherman's army.							Official Report of Brigadier General Kilpatrick.
Dec. 2d	Rocky Creek Church, Georgia	3d Kentucky and 5th Ohio Cavalry, advance of Sherman's army.							Official Report of Brigadier General Kilpatrick.
Dec. 2d	————, Mississippi	2d New York Cavalry			23				
Dec. 2d and 3d.	Block House, No. 2, Mill Creek, Chattanooga, Tennessee.	Detachment of the 115th Ohio Volunteers, 44th and two companies 14th U. S. Colored Troops.	12	46	57				Official Report of Colonel L. Johnson, 44th U. S. Colored Troops.
Dec. 3d	Thomas' Station, Georgia	92d Illinois Mounted Infantry	2	1					Official Report of Brigadier General Kilpatrick.
Dec. 4th	Coosaw River, South Carolina	25th Ohio Volunteers							Ohio in the War, Vol. 2, page 180.
Dec. 4th	Block House, No. 7, Overall's Creek, Tennessee.	Troops commanded by General Milroy		100				100*	Official Report of Major General Thomas.
Dec. 4th	Waynesboro' and Brier Creek, Georgia	3d Division, Cavalry of the Army of the Military Division of the Mississippi, Brigadier General Kilpatrick.						200	Official Report of Brigadier General Kilpatrick.
Dec. 4th	Statesboro', Georgia	Foragers of the 15th Corps		8	27	2		2	Official Report of Major General Hazen.
Dec. 5th to 8th.	Murfreesboro', Tennessee	Troops commanded by General Rosseau	30	175				197	Official Report of Major General Thomas. Also called the Cedars.
Dec. 6th to 9th.	Deveaux's Neck, South Carolina	26th, 33d, 34th, and 102d U. S. Colored Troops, 54th and 55th Massachusetts Colored Troops, 56th and 155th New York, and 25th and 107th Ohio Volunteers, and 3d Rhode Island Artillery, commanded by Gen. Hatch. Naval Brigade commanded by Commander Preble.	39	390	200			400*	Casualty Return, S. G. O. Also designated Tillafinney River, Mason's Bridge, and Gregory's Farm. The Confederate General L. H. Gartrell was wounded.
Dec. 6th	White Post, Virginia	Fifty men of the 21st New York Cavalry		30					
Dec. 7th	Ebenezer Creek, Cypress Swamp, Ga	9th Michigan and 9th Ohio Cavalry, rear guard of the left wing of Sherman's army.	2	3				17	Official Report of Brigadier General Kilpatrick.
Dec. 7th to 9th.	Ogeechee River, Georgia	Fifteenth and Seventeeth Corps, of the right wing, Major General O. O. Howard, of the Army of the Military Division of the Mississippi, Major General W. T. Sherman.							Official Report of Major General W. T. Sherman. Also designated Jenks' Bridge, Eden Station, and Poole's Station.
Dec. 7th to 11th.	Weldon Railroad expedition	2d Division, Cavalry Corps, Fifth Corps, and 3d Division of the Second Corps, Army of the Potomac.		100					Casualty Lists, S. G. O.
Dec. 8th and 9th.	Reconnoissance to Hatcher's Run, Va	3d and 13th Pennsylvania and 6th Ohio Cavalry, and the 1st Division, Second Corps.			125*				Casualty List, S. G. O.
Dec. 8th to 28th.	Raid to Gordonsville, Virginia	1st Division, Merritt's, and 3d Division, Custer's, Cav., Army of the Potomac, commanded by Gen. Torbett.		43					Casualty List, S. G. O.

* Killed, wounded, and missing.

DATE. 1864.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Dec. 9th to Jan. 14th.	Expedition into Western North Carolina.	3d North Carolina Volunteers, commanded by Colonel Kirk.	2	7	10	.....	.....	29*	Casualty List, S. G. O.
Dec. 9th...	Fort Lyons, Indian Territory.....	1st Colorado Cavalry, commanded by Colonel J. M. Chivington.	9	40	.....	.....	.....	.....	Massacre of 500 Indians. Also known as Sand Creek.
Dec. 9th...	Cuyler's Plantation, Monteith Swamp, Georgia.	Fourteenth Corps of the left wing of the Army of the Military Division of the Mississippi.	2	11	.....	.....	.....	4	Official Report of Major General J. C. Davis.
Dec. 9th to 12th.	Expedition to Hamilton, North Carolina.	27th Massachusetts and 9th New Jersey Volunteers, North Carolina Cavalry, and 3d New York Artillery.	.....	.....	.....	.....	.....	.....	Skirmishes at Foster's Bridge, 10th, and Butler's Bridge, 12th.
Dec. 9th...	Bellefield and Hicksford, Virginia.....	2d Division, Cavalry Corps, Army of the Potomac.....	.....	.....	.....	.....	.....	.....	Skirmish during the Weldon Railroad expedition.
Dec. 10th to 21st.	Siege of Savannah, Georgia.....	Fourteenth Corps, Major General Davis, and Twentieth Corps, Major General Williams,—left wing, Major General Slocum: Fifteenth Corps, Major General J. A. Logan, and Seventeenth Corps, Major General F. P. Blair,—right wing, Major Gen. O. O. Howard;—Army of the Military Division of the Mississippi, Major General W. T. Sherman.	.....	200	.....	.....	.....	800	Official Report of Major General Sherman. Appendix to Part I, Medical and Surgical History of the War, page 321. Casualty List, S. G. O.
Dec. 12th..	Elkton, Kentucky.....	1st Cavalry Division, commanded by Brigadier General McCook.	.....	.....	.....	.....	.....	.....	
Dec. 12th to 21st.	Stoneman's raid from Bean's Station, Tennessee, to Saltville, Virginia.	Cavalry of the Army of the Ohio, commanded by Gens. Burbridge and Gillem.	.....	.....	.....	.....	.....	.....	Engagements at Kingsport, 13th; Bristol, 14th; Abingdon and Glade Springs, 15th; Marion, 16th and 18th; and Saltville, 20th. Casualty List, S.G.O.
Dec. 13th..	Kingsport, Tennessee	8th, 9th, and 13th Tennessee Cavalry, commanded by Brigadier General Gillem.	2	7	.....	8	26	86	Official dispatches. Engagement during Stoneman's raid to Saltville.
Dec. 13th..	Fort McAllister, Georgia.....	2d Division, Major General Hazen's, Fifteenth Corps, of the Army of the Military Division of the Mississippi, Major General W. T. Sherman.	24	110	.....	.....	.....	250	Official Report of Major General W. T. Sherman.
Dec. 14th..	Bristol, Tennessee	Cavalry commanded by General Burbridge.....	.....	.....	.....	.....	.....	.....	Official dispatches. Engagement during Stoneman's raid to Saltville.
Dec. 14th..	Memphis, Tennessee.....	4th Iowa Cavalry.....	3	6	15	.....	.....	.....	Official.
Dec. 15th..	Abingdon, Virginia	Cavalry commanded by General Burbridge.....	.....	.....	.....	.....	.....	20	Engagement during Stoneman's raid to Saltville.
Dec. 15th..	Murfreesboro', Tennessee.....	Troops commanded by General Rosseau.....	.....	.....	.....	.....	.....	.....	Official Report of Major General Thomas.
Dec. 15th..	Glade Springs.....	12th Kentucky Cavalry.....	.....	.....	.....	.....	.....	.....	Engagement during Stoneman's raid to Saltville.
Dec. 15th and 16th.	Nashville, Tennessee.....	Fourth Corps, Major General Wood, Army of the Cumberland; Twenty-third Corps, Major General J. M. Schofield, Army of the Ohio; 1st and 3d Divisions, Sixteenth Corps, Major General A. J. Smith, Army of the Tennessee; detachments of colored troops, convaleseents, recruits, &c., Major General Steadman, and Cavalry Corps, Major Gen. Wilson,—commanded by Major General G. H. Thomas.	400	1,740	.....	.....	.....	4,462	Official Reports of Major General Thomas. Appendix to Part I, Medical and Surgical History of the War, page 323. Casualty List, S. G. O. Also designated Brentwood and Overton's Hills. Lieutenant General S. D. Lee and Brig. General Rulker, C. S. A., were wounded.
Dec. 16th..	Hopkinsville, Kentucky.....	2d and 3d Brigades, 1st Division, of Cavalry, McCook..	.....	.....	.....	.....	.....	.....	Report of Adjutant General of Wisconsin, 1865, page 592.

Dec. 16th..	Marion and Wytheville, Virginia	8th, 9th, and 13th Tennessee Cavalry, commanded by General Gillem.	.....	58	.....	.....	100	198	Casualty Return, S. G. O. Official reports. Engagement during Stoneman's raid to Saltville.
Dec. 17th..	Millwood, Virginia	A scouting party of the 14th Pennsylvania Cavalry	12	19	40	.....	.....	.....	Casualty List, S. G. O.
Dec. 17th..	Hollow Tree Gap, Tennessee	5th Division, Hatch's, and 7th Division, Knipe's, of Wilson's Cavalry, of General Thomas's army.	.....	.....	.....	.....	.....	413	Official Report of Major General Thomas.
Dec. 17th..	Franklin, Tennessee	6th Division, Johnson's, of Wilson's Cavalry, of Gen. Thomas's army.	.....	.....	.....	.....	.....	1,800	The prisoners captured were Confederates wounded in the engagement November 30th.
Dec. 17th..	Mitchell's Creek, Florida	82d U. S. Colored Troops, of Col. Robinson's command.	2	21	1	.....	.....	.....	Official.
Dec. 17th to 19th.	Pine Barren Creek, Alabama	82d and 97th U. S. Colored Troops, commanded by Colonel Robinson, 97th U. S. Colored Troops.	7	32	10	.....	.....	.....	
Dec. 18th..	Marion, Virginia	Cavalry of the Army of the Ohio, commanded by Gen. Burbridge.	18	58	.....	.....	.....	200	Official dispatches. Engagement during Stoneman's raid to Saltville. Casualty Return, S. G. O.
Dec. 18th..	Franklin Creek, Mississippi	Troops of the Third Corps, Major General Granger	.....	1	.....	.....	.....	.....	
Dec. 19th..	Rutherford Creek, Tennessee	Cavalry of General Thomas's army	.....	.....	.....	.....	.....	.....	Official Report of Major General Thomas.
Dec. 20th..	Saltville, Virginia	Gillem's and Burbridge's Cavalry, commanded by Gen. Stoneman.	.....	.....	.....	.....	.....	.....	Official Report of Major General Thomas.
Dec. 20th..	Lacey's Springs, Virginia	3d Division of Cavalry, Custer's, of the Army of the Potomac.	2	22	40	.....	.....	.....	Casualty List, S. G. O.
Dec. 20th..	Madison Court House	Michigan Cavalry Brigade of the 1st Division, Cavalry, Army of the Potomac.	.....	.....	.....	.....	.....	13*	Skirmish during the Gordonsville raid.
Dec. 23d..	Lynnville, Tennessee	Cavalry of General Thomas's army, commanded by General Wilson.	.....	.....	.....	.....	.....	.....	Official Report of Major General Thomas.
Dec. 23d..	Jack's Shop, near Gordonsville, Va	1st Cavalry Division, Merritt's, Army of the Potomac, and 2d Division, Cavalry, Powell's, Army of West Virginia.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O.
Dec. 23d..	Buford's Station, Tennessee	Cavalry of General Thomas' army, commanded by Gen. Wilson.	.....	.....	.....	.....	.....	.....	Official Report of Major General Thomas.
Dec. 24th..	Elizabethtown, Kentucky	1st Wisconsin Cavalry, of the 1st Cavalry Division, McCook's, Army of the Cumberland,	.....	.....	.....	.....	.....	11	Report of Adjutant General of Wisconsin, 1865, page 592.
Dec. 24th..	Mocassin Gap, Virginia	8th Tennessee Cavalry	.....	.....	.....	.....	.....	.....	Stoneman's raid.
Dec. 24th..	Murfreesboro', Tennessee	12th U. S. Colored Troops	3	.....	.....	.....	.....	.....	
Dec. 25th..	Fort Fisher, North Carolina	North Atlantic Squadron, commanded by Rear-Admiral Porter, and troops of the Tenth Corps, Army of the James, Major General B. F. Butler.	8	38	3	3	55	280	All the casualties were in the navy, and were caused by the bursting of six one-hundred-pound Parrott guns. Official report. Casualty List, S. G. O.
Dec. 25th..	Pulaski, Lamb's Ferry, Anthony's Hill, and Sugar Creek, Tennessee.	Cavalry of General Thomas's army	.....	.....	.....	.....	.....	200	Official Report of Major General Thomas.
Dec. 25th..	Verona, Mississippi	7th Indiana Cavalry, of Grierson's command	.....	.....	.....	.....	.....	26	Official Report of Major General B. H. Grierson.
Dec. 27th and 28th.	Decatur, Alabama	Major General Steadman's Provisional Division	.....	.....	.....	.....	.....	.....	Official Report of Major General Thomas.
Dec. 28th..	Egypt Station, Mississippi	7th Indiana, 4th and 11th Illinois, 4th and 10th Missouri, 2d Wisconsin, 2d New Jersey, 1st Mississippi, and 3d U. S. Colored Cavalry.	23	88	7	.....	.....	500	Official Report of Brigadier General B. H. Grierson, commanding. Brigadier General Gholson, C. S. A., was killed.
Dec. 29th..	Pond Spring, Alabama	15th Pennsylvania and detachments of the 2d Tennessee and 10th, 12th, and 13th Indiana Cavalry, commanded by Colonel Palmer.	.....	1	.....	1	2	45	Official Report of Major General Steadman.

* Killed, wounded, and missing.

DATE. 1865.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Jan. 2d...	Franklin, Mississippi	4th and 11th Illinois and 3d U. S. Colored Cavalry, commanded by Colonel Osband, 3d U. S. Colored Cavalry.	4	9	.....	20	30	.....	Casualty List, File A, No. 372, S. G. O. Official Report of Brigadier General B. H. Grierson.
Jan. 2d...	Nauvoo, Alabama	15th Pennsylvania and detachments of the 2d Tennessee and 10th, 12th, and 13th Indiana Cavalry.	.....	.....	.....	.....	.....	75	Official Report of Colonel Palmer, 15th Pennsylvania Cavalry. Capture and destruction of Hood's supply and pontoon train.
Jan. 3d...	Thorn Hill, Alabama	15th Pennsylvania and detachments of the 10th, 12th, and 13th Indiana and 2d Tennessee Cavalry.	1	2	.....	3	2	20	Official Report of Colonel Palmer, 15th Pennsylvania Cavalry.
Jan. 5th...	Smithfield, Kentucky	6th U. S. Colored Cavalry	2	.....	19	.....	.....	.....	Official.
Jan. 7th...	Julesburg, Indian Territory	One company of the 7th Iowa Cavalry	14	2	.....	.....	.....	.....	Report of Adjutant General of Iowa, 1865, p. 147. Engagement with Indians.
Jan. 8th...	Scottsboro', Alabama	Fifty-four men of the 101st U. S. Colored Troops	.....	5	.....	1	5	5	Official Report of Brigadier General C. Cruft.
Jan. 8th...	Ivy Ford, Arkansas	79th U. S. Colored Troops	.....	8	.....	.....	.....	.....	Official. Casualty Return, S. G. O.
Jan. 11th..	Beverly, West Virginia	34th Ohio Volunteers and 8th Ohio Cavalry	5	20	583	.....	.....	.....	Ohio in the War, Vol. 2, pages 227, 807.
Jan. 13th to 15th.	Fort Fisher, North Carolina	2d Division and 2d Brigade 1st Division, Twenty-fourth Corps, and 3d Division, Twenty-fifth Corps, of the Army of the James, commanded by Major General A. H. Terry, and sailors and marines of the Atlantic blockading squadron, commanded by Rear-Admiral Porter.	184	749	22	.....	400†	2,083	Official reports. Casualty List, S. G. O. Major General W. H. C. Whiting, commanding the Confederates, and Brig. Generals Bell, Curtis, and Penybacker, U. S. V., were wounded.
Jan. 14th..	Red Hill, Alabama	15th Pennsylvania Cavalry, commanded by Colonel W. J. Palmer.	.....	.....	.....	.....	.....	100	Official Report of Major General Thomas.
Jan. 14th..	Dardanelle, Arkansas	2d Kansas Cavalry and Iowa Cavalry	.....	6	.....	.....	90	.....	Casualty Return, File F, No. 233, S. G. O.
Jan. 14th to 16th.	Pocataligo, South Carolina	Seventeenth Corps, Major General Blair, Army of the Tennessee.	.....	25	.....	.....	.....	.....	Official Report of Major General Sherman. Casualty List, S. G. O.
Jan. 16th..	Explosion of the magazine of Fort Fisher.	Troops of General Terry's detachment of the Army of the James.	25	66	13	.....	.....	.....	Official. Casualty List, S. G. O.
Jan. 18th..	Ten miles from Columbus, Kentucky	Tennessee Cavalry	.....	.....	.....	.....	.....	.....	
Jan. 19th..	Half-moon Battery, Sugar Loaf Hill, North Carolina.	Portion of the Twenty-fourth and Twenty-fifth Corps, Army of the James.	.....	12	.....	.....	.....	.....	Report of Adjutant General of Connecticut, 1865, page 169. Casualty List, S. G. O.
Jan. 24th..	Fort Brady, Virginia	U. S. Colored Troops and Heavy Artillery of the Army of the James.	4	10	.....	5	14	.....	Also designated Fort Burnham or Boggs' Mills.
Jan. 25th..	Combahee River, South Carolina	Fifteenth Corps, Major Gen. Logan, and Seventeenth Corps, Major General Blair,—Army of the Tennessee, Major General O. O. Howard, of the Army of the Military Division of the Mississippi.	.....	50†	.....	.....	.....	.....	List of casualties, S. G. O. Appendix to Part I, Medical and Surgical History of the War, p. 321. Official Report of Major General Sherman.
Jan. 25th..	Powhatan, Virginia	1st U. S. Colored Cavalry	3	16	.....	.....	.....	.....	Official.
Jan. 25th..	Simpsonville, Kentucky	5th U. S. Colored Cavalry	.....	.....	39	.....	.....	.....	Official.
Jan. 29th to Feb. 11th.	Expedition into Western North Carolina.	3d North Carolina, Colonel Kirk	.....	.....	30*	.....	.....	.....	Casualty Return, S. G. O.

Feb. 3d to 9th.	River's Bridge, Salkahatchie, South Carolina.	Seventeenth Corps, Major General Blair, and Fifteenth Corps, Major Gen. Logan,—Army of the Tennessee.	18	70	4	.....	.....	.....	Includes skirmishes at Hickory Hill, Owen Cross Roads, Lowtonville, Duck Creek, and Whiphy Swamp. Official Report of Major General Sherman. List of casualties, S. G. O.
Feb. 5th to 7th.	Dabney's Mills, Hatcher's Run, Va.....	2d Division Cavalry, Gregg's; Second Corps, Major General Humphrey; Fifth Corps, Major General G. K. Warren; and 1st Division, Sixth Corps,—Army of the Potomac, Major General Meade.	232	1,062	186	.....	.....	1,200*	Official Report of Major General Grant. Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War. Also designated Rowanty Creek and Vaughn Road. Among the casualties in the Union army were Brigadier Generals Morrow, Smythe, Davis, Gregg, Ayres, Sickel, and Gwyn, wounded; in the Confederate army, General Pegram, killed, and Brigadier General Sorrell, wounded.
Feb. 5th...	Dunn's Lake, Volusia County, Florida..	Detachment of the 17th Connecticut Volunteers	1	1	34	.....	.....	.....	
Feb. 8th...	Mud Springs, Indian Territory.....	11th Ohio and 7th Iowa Cavalry	.....	.....	.....	.....	.....	.....	Engagement with Indians.
Feb. 8th...	Williston, South Carolina	Cavalry commanded by Brigadier General Kilpatrick ..	.....	.....	25*	.....	50†	40	Official Report of Major General Sherman, commanding Military Division of the Mississippi.
Feb. 9th...	Binnaker's Bridge, South Edisto River, South Carolina.	Seventeenth Corps, Major General Blair, Army of the Tennessee.	.....	.....	36*	.....	.....	.....	Casualty List, S. G. O. Official Report of Major General Sherman, commanding Military Division of the Mississippi.
Feb. 9th...	Rush Creek, Indian Territory.....	11th Ohio and 7th Iowa Cavalry.....	.....	.....	.....	.....	.....	.....	Engagement with Indians.
Feb. 10th..	James Island, South Carolina.....	Schimmelfennig's Division of the troops of the Department of the South, Major General Gillmore.	20	76	.....	20	70	25	Casualty List, File F, No. 208, S. G. O.
Feb. 11th..	Blackville, South Carolina	3d Division Cavalry, Kilpatrick's, Army of the Military Division of the Mississippi.	.....	.....	.....	.....	.....	.....	Official Report of Major General Sherman.
Feb. 11th..	Sugar Loaf Battery, Federal Point, North Carolina.	2d Division and 1st Brigade of the 1st Division, Twenty-fourth Corps, and 3d Division of the Twenty-fifth Corps, Army of the James, Major Gen. Terry.	14	114	.....	.....	.....	65	Official Report of Major General Schofield.
Feb. 11th..	Aiken, South Carolina	3d Division Cavalry, commanded by Gen. Kilpatrick..	.....	.....	.....	31	160	60	Official Report of Major General Sherman.
Feb. 12th..	Orangeburg, North Edisto River, South Carolina.	Seventeenth Corps, Army of the Tennessee, Major General Blair.	.....	.....	26*	.....	.....	.....	Official Report of Major General Sherman. Casualty Lists, S. G. O.
Feb. 14th..	Gunter's Bridge, South Carolina.....	3d Division Cavalry, Major General Kilpatrick, Army of the Military Division of the Mississippi.	.....	.....	.....	.....	.....	.....	Official report.
Feb. 15th..	Congaree Creek, South Carolina.....	Fifteenth Corps, Major General Logan, Army of the Tennessee.	.....	.....	.....	.....	.....	.....	Official Report of Major General Sherman, commanding Military Division of the Mississippi.
Feb. 16th..	Cedar Keys, Florida	2d U. S. Colored Troops.....	6	.....	3	.....	.....	.....	Official.
Feb. 16th and 17th.	Columbia, South Carolina	Fifteenth Corps, Major General J. A. Logan, Army of the Tennessee.	.....	20†	.....	.....	.....	.....	Official Report of Major General Sherman, commanding Military Division of the Mississippi.
Feb. 18th..	Fort Jones, Kentucky.....	12th U. S. Colored Heavy Artillery.....	2	.....	.....	.....	.....	.....	Official.
Feb. 18th..	Ashby Gap, Virginia.....	Detachment of the 14th Pennsylvania Cavalry	6	19	64	.....	.....	.....	Official Confederate reports.
Feb. 18th..	Charleston, South Carolina	Troops of the Department of the South, Major Gen. Q. A. Gillmore.	.....	.....	.....	.....	.....	.....	
Feb. 18th..	Fort Anderson, North Carolina.....	Navy, commanded by Rear-Admiral Porter; troops of the Twenty-fourth Corps, Army of the James, Major General Terry, and Twenty-third Corps, Army of the Ohio, Major General Cox.	10	50	.....	70	400	50	Official Reports of Rear-Admiral Porter and Major General Schofield, commanding.
Feb. 20th..	Fort Myers, Florida.....	.....	.....	.....	.....	.....	.....	.....	
Feb. 20th..	Town Creek, North Carolina	3d Division, Twenty-third Corps, Army of the Ohio, Major General J. D. Cox.	30	154	.....	.....	.....	375	Official Report of Major General Schofield. Casualty List, S. G. O.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1865.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Feb. 22d..	Wilmington, North Carolina.....	2d and 3d Divisions of the Twenty-third Corps, Army of the Ohio, Major General J. D. Cox, and a portion of the Twenty-fourth Corps, Army of the James, Major General Terry.	.....	.....	.....	.....	.....	.....	Official Report of Major General Schofield. Casualty List, S. G. O.
Feb. 22d..	Douglas Landing, Pine Bluff, Arkansas..	13th Illinois Cavalry.....	.....	40	.....	.....	26	.....	Official.
Feb. 26th..	Mount Clio, South Carolina	Detachment of mounted men, commanded by Captain Duncan.	.....	.....	.....	.....	.....	.....	Official Report of Major General Sherman.
Feb. 26th..	Lynch Creek, South Carolina.....	Advance of the Fifteenth Corps, Major General Logan.	.....	.....	.....	.....	.....	.....	
Feb. ——	Chattanooga, Tennessee.....	16th U. S. Colored Troops.....	1	.....	10	.....	.....	.....	
Feb. 27th to Mar. 25th	Sheridan's raid in Virginia	1st Division, Major General Devin, and 3d Division, Major General Custer, Cavalry Corps,—Army of the Potomac, Major General Sheridan.	.....	.....	.....	.....	.....	.....	Official Report of Major General Sheridan. Includes skirmishes at Mount Crawford, Feb. 29th, Waynesboro', March 2d, and Ashland, Mar. 15th.
Feb. 29th..	Mount Crawford, Virginia	3d Brigade, 3d Division, Cavalry Corps, Army of the Potomac.	.....	5	.....	.....	.....	30	Skirmish during Sheridan's raid, February 27th to March 25th.
Mar. 2d...	Waynesboro' Virginia.....	3d Division, Brigadier General Custer, Cavalry Corps, Major Gen. Sheridan, Army of the Potomac.	.....	.....	30*	.....	.....	1, 600	Official Report of Major General Sheridan. Casualty List, S. G. O.
Mar. ——	Clinton, Louisiana.....	4th Wisconsin Cavalry.....	2	4	1	.....	.....	.....	Official.
Mar. 2d...	Chesterfield, South Carolina	Advance of the Twentieth Corps, Major General A. S. Williams.	.....	.....	.....	.....	.....	.....	Official Report of Major General Sherman. Casualty List, S. G. O.
Mar. 2d and 3d.	Cheraw, South Carolina	Advance of the Seventeenth Corps, Major General F. P. Blair.	.....	.....	.....	.....	.....	.....	Official Report of Major General Sherman. Casualty List, S. G. O.
Mar. 3d...	Florence, South Carolina.....	Detachment of mounted infantry from General Sherman's Army.	.....	.....	.....	.....	.....	.....	Official Report of Major General Sherman.
Mar. 6th...	Olive Branch, Louisiana.....	4th Wisconsin Cavalry	3	2	.....	.....	.....	.....	Report of Adjutant General of Wisconsin, 1865, page 637.
Mar. 6th...	Natural Bridge, Florida.....	2d and 99th U. S. Colored Troops, and other troops, commanded by General Newtown.	22	46	13	.....	.....	.....	Official.
Mar. 6th...	North Fork, Shenandoah, Virginia.....	Portion of Sheridan's Cavalry, commanded by Colonel Thompson, 1st New Hampshire Cavalry, guarding prisoners.	.....	.....	.....	.....	.....	37	Official report.
Mar. 7th...	Rockingham, North Carolina	Cavalry Division, Kilpatrick's, of Sherman's Army....	.....	.....	.....	.....	.....	.....	
Mar. 8th to 10th.	Wilcox's Bridge, Wisc's Fork, North Carolina.	1st Division, Palmer's, and 2d Division, Carter's, of the District of Beaufort, and 1st Division, Ruger's, Twenty-third Corps, Army of the Ohio.	80	421	600	.....	.....	1, 500*	Official Report of Major General Schofield.
Mar. 10th..	Monroe's Cross Roads, North Carolina...	Cavalry Division, Brigadier General Kilpatrick.....	19	61	103	.....	86†	.....	Official Report of Major General Sherman.
Mar. 11th..	Clear Lake, Arkansas	3d Wisconsin Cavalry.....	.....	5	11	.....	.....	.....	Official.
Mar. 13th..	Silver Run, Fayetteville, North Carolina.	Advance of the Fourteenth and Seventeenth Corps	.....	.....	.....	.....	.....	.....	Official Report of Major General Sherman.
Mar. 14th..	Kingston, North Carolina.....	Major General Schofield's command.....	.....	.....	.....	.....	.....	.....	Occupied by nationals.
Mar. 15th..	South Anna River, Virginia	5th U. S. Cavalry, 1st Division Cavalry, Major General Sheridan.	.....	.....	.....	.....	.....	.....	Official Report of Major General Sheridan.

Mar. 15th..	Taylor's Hole Creek	Kilpatrick's Cavalry, advance of General Sherman's forces.	.....	.....	.....	.....	.....	.....	Official Report of Major General Sherman.
Mar. 15th..	Ashland, Virginia	2d Brigade, 3d Division, Cavalry Corps, Army of the Potomac.	.....	.....	.....	.....	.....	.....	Casualty List, S. G. O. Official Report of Major General Sheridan.
Mar. 16th..	Averysboro', North Carolina	Twentieth Corps, Major General Williams, and Cavalry Division, Brigadier Gen. Kilpatriek,—Army of the Military Division of the Mississippi, Gen. Sherman.	77	477	.....	108	540	217	Official report. Also designated Smith's Farm. Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, p. 323.
Mar. 18th..	Boyd's Station, Alabama	101st U. S. Colored Troops	5	.....	1	.....	.....	.....	Official.
Mar. 19th to 21st.	Bentonville, North Carolina	Fourteenth Corps, Major General J. C. Davis, and Twentieth Corps, Major General A. S. Williams,—left wing, Major General Slocum; Fifteenth Corps, Major General J. A. Logan, and Seventeenth Corps, Major General F. P. Blair,—right wing, Major Gen. O. O. Howard; and Cavalry Division, Brig. General Kilpatriek;—Army of the Military Division of the Mississippi, Major General W. T. Sherman.	191	1,168	287	267	1,200	1,625	Appendix to Part I, Medical and Surgical History of the War, page 321. Casualty List, S. G. O. Official report.
Mar. 20th to Apr. 6th.	Stoneman's raid, Southwestern Virginia and North Carolina.	Palmer's, Brown's, and Miller's Brigades of Cavalry, commanded by Major General Gillem.	.....	.....	.....	.....	.....	.....	
Mar. 21st..	Goldsboro', North Carolina	Major General Schofield's command	.....	.....	.....	.....	.....	.....	Occupied by the nationals.
Mar. 21st..	Hamilton, Virginia	12th Pennsylvania Cavalry	.....	25	20	.....	10	.....	Casualty List, S. G. O.
Mar. 23d..	Sumpterville, South Carolina	.....	.....	.....	.....	.....	.....	.....	Ohio in the War, Vol. 2, page 578.
Mar. 24th..	Rerock, Arizona Territory	1st New Mexico Cavalry	.....	6	.....	.....	.....	.....	Official.
Mar. 24th..	Coxe's Bridge, North Carolina	Provisional Corps, commanded by Major Gen. Terry	.....	9	.....	.....	.....	.....	Casualty List, S. G. O.
Mar. 25th..	Fort Steadman, in front of Petersburg, Virginia.	1st and 3d Divisions, Ninth Corps, Major General Parke, Army of the Potomac.	68	337	506	.....	800 †	1,881	Appendix to Part I, Medical and Surgical History of the War, page 203. Casualty List, S. G. O. Official reports. The Confederate Generals Terry and Cooke were wounded.
Mar. 25th..	Petersburg, Virginia	Second Corps, Major General A. A. Humphreys, and Sixth Corps, Major General H. G. Wright,—Army of the Potomac.	103	864	209	.....	.....	834	Appendix to Part I, Medical and Surgical History of the War, p. 203. List of casualties, S. G. O. Official reports.
Mar. 25th.	Pine Barren Creek, Alabama	Cavalry advance of General Steele's column	2	10	.....	.....	.....	275	Also known as Bluff Spring. Gen. Clanton, C. S. A., killed.
Mar. 26th to Apr. 9th.	Siege of Mobile, Alabama	Army of the Military Division of the West Mississippi, commanded by Major General E. R. S. Canby.	.....	.....	.....	.....	.....	.....	See engagement at Spanish Fort, March 26th to April 9th, and Fort Blakely, April 9th.
Mar. 26th to Apr. 8th.	Spanish Fort, Alabama	Thirteenth Corps, Major General F. Steele, and Sixteenth Corps, Major Gen. A. J. Smith,—Army of the Military Division of the West Mississippi, commanded by Major Gen. E. R. S. Canby, and Navy, commanded by Commodore Thatcher.	100	695	.....	.....	.....	552	Appendix to Part I, Medical and Surgical History of the War, page 337. List of casualties, S.G.O.
Mar. 29th..	Quaker Road, Gravelly Run, Virginia	1st Division, Major General Griffin, and Fifth Corps, Major General G. K. Warren,—Army of the Potomac.	55	306	22	135	400	100	Appendix to Part I, Medical and Surgical History of the War, page 204. List of casualties, S. G. O. Official reports.
Mar. 22d to Apr. 24th.	Wilson's raid, Chickasaw, Alabama, to Macon, Georgia.	1st Brigade, Brigadier Gen. Croxton, and 2d Brigade, Colonel O. H. Lagrange,—1st Division, Maj. General E. M. McCook; 1st Brigade, Col. O. A. Miller, and 2d Brigade, Colonel R. G. Minty,—2d Division, Brig. General Eli Long; 1st Brigade, Brigadier General E. F. Winslow, and 2d Brigade, Brigadier Gen. Alexander,—4th Division Cavalry, Maj. Gen. E. Upton;—Cavalry Corps of the Military Division of the Mississippi, Major General Jos. H. Wilson.	99	598	28	.....	1,200 †	6,820	Official Report of Major General J. H. Wilson, commanding. Appendix to Part I, Medical and Surgical History of the War, page 327. List of casualties, S. G. O. General Eli Long, wounded. Includes engagements at Montavallo, Mar. 31st; Plantersville, Trion, April 1st; Scottsville, Selma, April 2d; Northrop, April 3d; Tusealoosa, Apr. 4th; Pleasant Ridge, April 6th; Lowndesboro', April 10th; Montgomery, Apr. 12th; Fort Tyler, West Point, and Columbus, April 16th; and Tobosofkee and Macon, April 20th.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1865.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
Mar. 31st..	Boydton and White Oak Roads, Va.....	Fifth Corps, Major General G. K. Warren, and Second Corps, Major General A. A. Humphreys,—Army of the Potomac.	177	1,134	556	.....	1,000	235	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 211.
Mar. 31st..	Dinwiddie Court House, Virginia.....	1st Division, Devins; 2d Division, Crook; 3d Division, Custer,—Cavalry Corps, Major General Merritt;—Army of the Potomac, Major General P. H. Sheridan.	67	354	.....	.....	.....	400*	Casualty List, S. G. O. Appendix to Part I, Medical and Surgical History of the War, page 203.
Mar. 31st..	Montavallo and Six Mile Creek, Ala.....	4th Division, Cavalry Corps, Major General Upton.....	.....	.....	.....	.....	.....	.....	Official report. Engagement during Wilson's raid, March 22d to April 20th.
April 1st..	Five Forks, Virginia, ...	Division of Cavalry of the Army of the James, McKenzie; 1st Division, Devins. 2d Division, Crook, and 3d Division, Custer,—Cavalry Corps, Major General Merritt, and Fifth Corps, Maj. General G. K. Warren, of the Army of the Potomac, commanded by Major General P. H. Sheridan.	124	706	54	.....	3,000†	5,500	Brigadier General Winthrop, U. S. V., was killed. Appendix to Part I, Medical and Surgical History of the War, page 203. Casualty List, S. G. O.
April 1st..	Boone, North Carolina.....	.....	.....	.....	.....	.....	.....	75	Stoneman's raid, March 20th to April 22d.
April 1st..	Trion, Alabama.....	1st Brigade, Croxton, 1st Division, McCook, Cavalry Corps, of the Army of the Military Division of the Mississippi.	3	10	20	.....	.....	.....	Official report. Wilson's raid, Mar. 22d to Apr. 20th.
April 1st..	Mount Pleasant, Alabama.....	Cavalry of General Canby's forces, commanded by General Lucas.	.....	5	.....	.....	.....	63	Lossing's Civil War in America, Vol. 3, page 514.
April 1st..	Centreville, Alabama	2d Brigade, La Grange, 1st Division, McCook, Cavalry Corps, of the Military Division of the Mississippi.	.....	.....	.....	.....	.....	15	Engagement during Wilson's raid, March 22d to April 20th.
April 1st..	Bogler's Creek and Plantersville, Ala...	2d Division, Brigadier General Eli Long, and 4th Division, Major General Upton, Cavalry Corps, of the Military Division of the Mississippi.	.....	.....	.....	.....	.....	.....	Also known as Ebenezer Church and Maplesville. Engagement during Wilson's raid, March 22d to April 20th.
April 2d...	Selma, Alabama.....	2d Division, Brigadier Gen. Eli Long, Cavalry Corps, of the Military Division of the Mississippi, Major General J. H. Wilson.	42	270	7	.....	.....	2,700	Official report. Engagement during Wilson's raid, March 22d to April 20th. Brigadier General Long was wounded.
April 2d...	Scottsville, Alabama.....	2d Brigade, La Grange, 1st Division, McCook, Cavalry Corps, of the Military Division of the Mississippi.	1	8	6	3	10	.....	Engagement during Wilson's raid, March 22d to April 20th.
April 2d...	Fall of Petersburg, Virginia.....	Second Corps, Major General A. A. Humphrey; Sixth Corps, Major Gen. H. G. Wright; and Ninth Corps, Major General J. G. Parke.—of the Army of the Potomac, Major Gen. G. G. Meade; Twenty-fourth Corps, Major General Gibbons,—Army of the James, Major General E. O. C. Ord.	296	2,565	500	.....	.....	3,000	Appendix to Part I, Medical and Surgical History of the War, page 203. Among the casualties were Lieut. General D. H. Hill, C. S. A., killed, Major Generals L. A. Grant and Potter. Brig. Generals Chamberlain, Dennison, Sickels, Madill, and McDougall, U. S. A., wounded. List of casualties, S. G. O. Official reports.
April 3d...	Namozin Church and Willicomack, Va..	3d Division, Custer, Cavalry Corps, Major Gen. P. H. Sheridan, Army of the Potomac.	10	85	.....	.....	.....	.....	Casualty List, S. G. O.
April 3d...	Richmond, Virginia.....	.....	.....	.....	.....	.....	.....	6,000	Occupied by troops commanded by Major General Weitzel. Five thousand of the prisoners captured were sick and wounded in the hospitals.
April 3d...	Salem, North Carolina	Cavalry, commanded by Colonel Palmer	.....	.....	.....	.....	.....	.....	Stoneman's raid.
April 3d...	Wytheville, Virginia.....	15th Pennsylvania Cavalry, commanded by Colonel Miller.	.....	.....	.....	.....	.....	.....	Stoneman's raid.

April 3d	Northport, Alabama	1st Brigade, Croxton, 1st Division, McCook, Cavalry Corps, of the Military Division of the Mississippi.						60	Wilson's raid, March 22d to April 20th.
April 4th	Deep River Bridge, North Carolina							00	Stoneman's raid.
April 4th	Tuscaloosa, Alabama	1st Brigade, Croxton, 1st Division, McCook, Cavalry Corps, of the Military Division of the Mississippi.						150	Wilson's raid, March 22d to April 20th.
April 5th	Amelia Springs, Virginia	2d Division, Crook, Cavalry Corps, Sheridan, of the Army of the Potomac.	20	96					Official Report of Major General P. H. Sheridan. Also designated Jettersville.
April 6th	Sailor's Creek, Virginia	Cavalry Corps, Major General P. H. Sheridan; Second Corps, Major General A. A. Humphreys; and Sixth Corps, Major General H. G. Wright,—Army of the Potomac.	166	1,014			1,000†	6,000	Appendix to Part I, Medical and Surgical History of the War, page 203. Casualty List, S. G. O. Official Report of Major General P. H. Sheridan, commanding. Also designated Harper's Farm and Deatonsville.
April 6th	Sipsey Swamp, Alabama	1st Brigade, Croxton, 1st Division, McCook, Cavalry Corps, of the Military Division of the Mississippi.	4	24	30				Wilson's raid, March 22d to April 20th.
April 6th	High Bridge, Appomattox River, Va	Portion of the Twenty-fourth Corps	10	31	1,000				General Theodore Read, commanding, was killed. Casualty List, S. G. O.
April 7th	Farmville, Virginia	Second Corps, Major General A. A. Humphrey, Army of the Potomac, Major General G. G. Meade.			655*				Appendix to Part I, Medical and Surgical History of the War, page 203. List of casualties, S. G. O. Generals Smyth and Mott were wounded.
April 8th and 9th.	Appomattox Court-House, Virginia	Cavalry of the Army of the Potomac. Major General Sheridan, and Twenty-fourth Corps and one division of the Twenty-fifth Corps, Major General Ord.			200*	500			Appendix to Part I, Medical and Surgical History of the War, page 203. Casualty List, S. G. O. Also designated Clover Hill.
April 9th	Fort Blakely, Alabama	Thirteenth Corps, Major General F. Steele, and Sixteenth Corps, Major General Smith,—Army of the Military Division of the West Mississippi, Major General E. R. S. Canby.	113	516			500†	2,400	Appendix to Part I, Medical and Surgical History of the War, page 337. Casualty List, S. G. O. Siege of Mobile.
April 9th	Lee surrendered	Armies of the Potomac and James, Major General U. S. Grant.						26,000	
April 9th	Sumterville, South Carolina	Troops of the Department of the South		28					Casualty List, File F, No. 209, S. G. O.
April 10th	Neuses River, North Carolina	Advance of Major General Sherman's Army							Official Report of Major General Sherman.
April 10th	Lowndesboro', Alabama	2d Brigade, La Grange's, 1st Division, McCook's, of the Cavalry Corps of the Military Division of the Mississippi.							Engagement during Wilson's raid, March 22d to April 20th.
April 12th and 13th.	Montgomery, Alabama	2d Brigade, La Grange's, 1st Division, McCook's, Cavalry Corps of the Military Division of the Mississippi.						50	Official report. Engagement during Wilson's raid, March 22d to April 20th.
April 12th	Grant's Creek, Salisbury, North Carolina.							364	Stoneman's raid.
April 13th	Whistler's Station, Alabama	3d Division of the Thirteenth Corps, Army of the West Mississippi.							
April 16th	South Fork, John Day's River, Oregon	One company of the 1st Oregon Cavalry		4					Official.
April 16th	Fort Taylor, West Point, Georgia	2d Brigade, La Grange's 1st Division, McCook's, Cavalry Corps, of the Military Division of the Mississippi.	7	29		19	28	218	Wilson's raid, March 22d to April 20th. The Confederate commander, General Tyler, was killed.
April 16th	Columbus, Georgia	4th Division, Upton's, Cavalry Corps of the Military Division of the Mississippi.	6	24				1,200	Wilson's raid, March 22d to April 20th.
April 17th	Berryville, Virginia	Major General Hancock's command						700	Surrender of Mosby's command.
April 18th	Boykin's Mills, South Carolina	Troops of the Department of the South		20					Also called Bradford Springs.

* Killed, wounded, and missing. † Killed and wounded.

DATE. 1865.	LOCALITY.	UNION TROOPS ENGAGED.	UNION LOSS.			CONFED. LOSS.			REMARKS AND REFERENCES.
			Killed.	Wounded.	Missing.	Killed.	Wounded.	Missing.	
April 19th.	Swift Creek, South Carolina	Troops of the Department of the South	.....	10	.....	.....	.....	.....	
April 19th.	Dallas, North Carolina	.....	.....	.....	.....	.....	.....	.....	Stoneman's raid.
April 19th.	Catawba River, North Carolina	.....	.....	.....	.....	.....	.....	325	Stoneman's raid.
April 20th.	Tobosofkee, Georgia	17th Indiana Mounted Infantry, advance of Wilson's Cavalry.	.....	.....	.....	.....	.....	30	Wilson's raid, March 22d to April 20th.
April 20th.	Macon, Georgia	2d Division, Wilson's Cavalry Corps	.....	.....	.....	.....	.....	2, 193	Wilson's raid, March 22d to April 20th.
April 22d..	Talladega, Alabama	1st Brigade, Croxton's, 1st Division, McCook's, Cavalry Corps of the Military Division of the Mississippi.	.....	.....	.....	.....	.....	.....	Wilson's raid in Alabama, March 22d to April 20th.
April 23d..	Mumford's Station, Blue Mount, Ala.	1st Brigade, Croxton's, 1st Division, McCook's, Cavalry Corps of the Military Division of the Mississippi.	.....	.....	.....	.....	.....	150	Wilson's raid, March 22d to April 20th.
April 23d..	Suwano Gap, North Carolina	Gillem's Cavalry command	.....	.....	.....	.....	.....	.....	
April 26th.	Johnston surrendered	Armies of the Tennessee, Georgia, and Ohio, Major General Sherman.	.....	.....	.....	.....	.....	29, 924	
May 4th...	Taylor surrendered	.....	.....	.....	.....	.....	.....	10, 000	
May 10th..	Irwinsville, Georgia	1st Wisconsin and 4th Michigan Cavalry	2	4	.....	.....	.....	21	Jefferson Davis captured. Official Report of Major General Wilson. The casualties were caused by the pursuing parties firing into each other.
May 10th..	Sam Jones surrendered at Tallahassee, Florida.	Detachment from Wilson's Cavalry Corps, commanded by Major General McCook.	.....	.....	.....	.....	.....	8, 000	Official reports.
May 11th..	Jeff Thompson surrenders at Chalk Bluff, Arkansas.	General Dodge's forces	.....	.....	.....	.....	.....	7, 454	
May 13th..	Palmetto Ranch, Texas.	62d U. S. Colored Troops, 34th Indiana Volunteers, and 2d Texas Cavalry.	.....	.....	118*	.....	.....	.....	Report of Adjutant General of Indiana, Vol. II, page 343.
May 26th..	Kirby Smith surrenders	Major General Canby's command	.....	.....	.....	.....	.....	20, 000	

* Killed, wounded, and missing.

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ON SPECIAL WOUNDS AND INJURIES.

CHAPTER I.

WOUNDS AND INJURIES OF THE HEAD.

The wounds and injuries of the head will be described in three categories: incised and punctured wounds, comprising, mainly, the sabre-cuts, bayonet stabs, and sword thrusts; miscellaneous injuries, resulting from falls, blows from blunt weapons, and various accidents; and lastly, and principally, gunshot wounds.

Section I.

INCISED AND PUNCTURED WOUNDS.

The cases of incised and punctured wounds of the head are subdivided into those in which the lesions involved the integuments only, and those in which the bones of the skull, and, in some instances, its contents, were injured. Brief abstracts, arranged in alphabetical order, are given of all the examples of incised and punctured wounds of the head, recorded in the Surgeon General's Office. The names of the wounded of the United States Armies are printed in small capitals; those of the Confederate Armies are distinguished by italics.

Incised Scalp Wounds.—The returns furnish memoranda of two hundred and eighty-two cases of incised wounds of the head which appeared to involve the integuments only, as follows:

Adams, Oscar H., Assistant Surgeon 8th New York Cavalry, aged 32 years. Wounded at Lacey's Springs, Virginia, December 21st, 1864, by a sabre-cut five inches in length over the right parietal and temporal regions. Admitted to Officers' General Hospital, Annapolis, Maryland, January 4th, 1865. On leave January 18th. Re-admitted February 5th. Suffers from frequent attacks of vertigo, incipient amaurosis, loss of memory, partial paralysis of right eyelid, and imperfect vision. Resigned February 17th, 1865.

Adams, J. F., Private, Co. I, 21st Virginia Cavalry. Incised wound of the scalp. Opequan, Virginia, September 19th, 1864. Admitted to Sheridan Field Hospital, September 24th. Recovered and transferred for exchange, November 15th, 1864.

Agee, John, Private, Co. G, 21st Virginia Cavalry. Incised wound of the scalp. Newtown, Virginia, November 9th, 1864. Captured and admitted to Sheridan Field Hospital, November 14th. Transferred for exchange November 15th, 1864, well.

Akins, Charles, Sergeant, Co. A, 3d New Jersey Cavalry, aged 24 years, received at Appomattox Court House, Virginia, April 8th, 1865, a slight cut over the forehead, implicating the scalp only, and a gunshot wound, for which the middle toes of the right foot were amputated. Admitted to Jarvis Hospital, Baltimore, Maryland, on April 22d, and transferred, July 24th, to Hicks Hospital, from whence he was transferred, well, September 6th, 1865, to New York, to be mustered out of service.

Anderson, Ransom A. D., Private, Co. B, 6th U. S. Colored Artillery, aged 22 years. Three sabre-cuts of the scalp and one of the right hand. Fort Pillow, Tennessee, April 12th, 1864. Admitted to Mound City Hospital, Illinois, April 17th. Returned to duty June 21st, 1864. (*See Report No. 55, House of Representatives, 1st Session 38th Congress.*)

Austin, George W., Private, Co. B, 1st Vermont Cavalry, aged 23 years. Incised wound of scalp over left parietal region. Wilderness, May 5th, 1864. Admitted to Douglas Hospital, Washington, D. C., May 11th. Transferred May 14th to Mower Hospital, Philadelphia. Returned to duty September 4th, 1864.

Bailey, Simon Z., Private, Co. B, 18th Pennsylvania Cavalry, aged 28 years, received a sabre-cut of the scalp at Hanover, Pennsylvania, June 30th, 1863. Admitted to Cuyler Hospital, Germantown, Pennsylvania, October 2d, 1863. Transferred to Christian Street Hospital, Philadelphia, December 21st. Deserted February 17th, 1864.

Baker, Ezekiel, Private, Co. K, 4th Pennsylvania Cavalry. Sabre-cut of the scalp. Middleburg, Virginia, June 19th, 1863. Admitted to Emory Hospital, Washington, June 21st. Returned to duty August 13th, 1863.

Beals, D. A., Private, Co. A, 1st Michigan Cavalry, aged 23 years. Sabre-cut of the scalp. Gettysburg, July 1st, 1863. Admitted to Satterlee Hospital, Philadelphia, July 10th. Returned to duty October 23d, 1863.

Bates, George L., Private, Co. B, 1st Vermont Cavalry. Sabre-cut of the head. Mount Jackson, Virginia, October 7th, 1864. Admitted to hospital at Brattleboro, Vermont, April 2d, 1865. Returned to duty June 23d, 1865.

Baugh, J. F., Private, Co. A, 1st Georgia Cavalry. Sabre-cut of the head. Admitted to hospital, Petersburg, Virginia, November 18th, 1862. Returned to duty December 2d, 1862.

Beckner, Abner, Private, Co. G, 21st Virginia Cavalry, aged 45 years. Sabre-cut of the left parietal region. Front Royal, Virginia, November 12th, 1864. Admitted to West's Buildings Hospital, Baltimore, Maryland, November 16th. Transferred to Fort McHenry, January 8th, 1865, and thence to Point Lookout, and exchanged June 28th, 1865.

Belcher, A. F., Lieutenant, 4th Massachusetts Cavalry, received a sabre-cut an inch and a half long over the left superciliary ridge, and a fracture of the left clavicle by a fall from his horse. High Bridge, Virginia, April 8th, 1865. Admitted to Officers' Hospital, Point of Rocks, Virginia, April 14th. Loss of vision of the left eye resulted, but whether from division of the supra-orbital nerve, or derangement of the optical apparatus caused by the concussion, was not determined. The fractured clavicle united and the wounds healed. He was discharged from service June 6th, 1865, and placed on the Pension List. On September 4th, 1867, he was reported as suffering from the permanent loss of the left eye; but without other disability.

Bennett, Edward H., Corporal, Co. F, 2d New York Cavalry, received a slight sabre-cut on the right side of the scalp, at New Market, Virginia, October 19th, 1863. Admitted to Lincoln Hospital, Washington, October 21st, and transferred October 31st.

Bennett, Thomas F., Private, Co. K, 10th Virginia Cavalry, received a sabre-cut of the scalp at Gettysburg, July 2d, 1863. Admitted to Seminary Hospital, Gettysburg, July 3d, and transferred thence to David's Island, New York Harbor, on July 17th, and on August 24th, being entirely well, he was paroled and sent to Fort Monroe for exchange.

Benton, H. L., Private, Co. G, 1st Massachusetts Cavalry. Sabre-cut of the scalp. Aldie, Virginia, June 17th, 1863. Returned to duty September 25th, 1863.

Bertram, Harry, Corporal, Co. K, 6th Ohio Cavalry, aged 30 years. Sabre-cut of the left occipital region two inches in length. Sheridan's Raid, May 12th, 1864. Admitted to Hammond Hospital, Point Lookout, Maryland, May 16th. Returned to duty June 28th, 1864.

Best, Thomas W., Private, Co. A, 6th Pennsylvania Cavalry. Sabre-cut of the right occipital region. Admitted to Second Division Hospital, Annapolis, Maryland, June 14th, 1863. Deserted July 7th, 1863. His name was on the Pension List September 4th, 1867, his disability being rated as "total and temporary."

Bigger, Samuel T., Private, Co. C, 1st Delaware Cavalry. Sabre-cut of the scalp. Gettysburg, July 1st, 1863 Admitted to Tilton Hospital, Wilmington, Delaware, July 4th. Returned to duty, well, August 22d, 1863.

BLIVINS, JOHN, Private, Co. K, 1st Alabama Cavalry, received a slight sabre-cut of the scalp at Moore's Cross Roads, North Carolina, March 10th, 1865. Mustered out of service July 19th, 1865.

BOHNE, CHARLES, Bugler, Co. I, 18th Pennsylvania Cavalry. Sabre-cut of the left parietal region, and a wound of the arm. Hagerstown, Maryland, July 6th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, August 3d. Deserted October 15th, 1863.

BOILEAU, JAMES P., Private, Co. A, 1st Delaware Volunteers, aged 21 years. Sabre-cut of the scalp. Weldon Railroad, Virginia, August 25th, 1864. Admitted to Tilton Hospital, Wilmington, Delaware, November 1st, from Harewood Hospital, Washington. Returned to duty November 14th, 1864.

BOLTON, MARVIN, Corporal, Co. G, 1st Michigan Cavalry. Sabre-cut of the scalp. Gettysburg, July 1st, 1863. Admitted to Jarvis Hospital, Baltimore, July 20th. Transferred to Carver Hospital, Washington, July 23d. Returned to duty November 17th, 1863.

BOULSON, EDWARD F., Sergeant, Co. B, 5th Michigan Cavalry. Sabre-cut of the occipital region. Trevillian Station, Virginia, June 12th, 1864. Missing in action. Died at Andersonville, Georgia, August 15th, 1864.

Bourne, L., Private, Co. K, 51st Virginia Infantry. Sabre-cut of the scalp. Opequan Creek, Virginia, September 19th, 1864. Admitted to Field Hospital, Winchester, Virginia, on the same day. Recovered and transferred for exchange December 20th, 1864.

BOYER, JOSEPH C., Captain, Co. L, 12th Tennessee Cavalry, aged 23 years. Sabre-cut of the forehead, received in a hand to hand fight with a rebel officer of General Forrest's command. Nashville, December 16th, 1864. Mustered out of service October 7th, 1865.

BRADFORD, JAMES, Private, Co. B, 3d Pennsylvania Cavalry. Sabre-cut of the scalp. Gettysburg, July 1st, 1863. Admitted to Field Hospital July 7th. Transferred to Satterlee Hospital, Philadelphia, July 9th. Returned to duty July 27th, 1863.

BREES, THEODORE J., Private, Co. L, 2d United States Cavalry. Sabre-cut of the scalp, and gunshot wound of left hand. Culpepper, Virginia, August 1st, 1863. Admitted to Douglas Hospital, Washington, August 3d. Transferred to Carlisle Barracks September 11th, 1863, and returned to duty.

BRENAGE, LAFAYETTE, Sergeant, Co. D, 21st Pennsylvania Cavalry. Sabre-cuts of the scalp and face. Jettersville, Virginia, April 5th, 1865. Admitted to Cavalry Corps Hospital April 12th. Returned to duty April 18th, 1865.

BRIGGS, WILLIAM H., Private, Co. M, 5th Michigan Cavalry, aged 17 years. Sabre-cuts of the scalp and right ear. Lynchburg, Virginia, June 11th, 1864. Admitted to Mount Pleasant Hospital, Washington, June 20th. Returned to duty July 26th, 1864.

BRILL, WILLIAM, Private, Co. H, 15th New York Cavalry, aged 18 years. Sabre-cuts of the scalp. Winchester, Virginia, November 15th, 1864. Admitted to hospital at Annapolis Junction, Maryland, January 4th, from Patterson Park Hospital, Baltimore. Returned to duty March 25th, 1865.

BROOKS, J. K., Sergeant, Co. C, 1st Maine Cavalry. Sabre-cut of right side of scalp. Middleburg, Virginia, June 19th, 1863. Admitted to Emory Hospital, Washington, June 21st. Returned to duty July 3d, 1863.

BROWN, JAMES, Private, Co. H, 1st Maryland Volunteers, aged 34 years. Sabre-cut of the scalp, while on picket at Hatcher's Run, Virginia, March 20th, 1865. Admitted to Satterlee Hospital, Philadelphia, April 7th, from Lincoln Hospital, Washington. Furloughed April 25th, 1865. Discharged from service July 10th, 1865.

BROWN, JASPER, Private, Co. D, 5th Michigan Cavalry. Sabre-cuts of the scalp and neck. Hanover, Pennsylvania, June 30th, 1863. Admitted to hospital at Gettysburg July 3d. Transferred to Patterson Park Hospital, Baltimore, November 11th. Returned to duty February 24th, 1864.

Brown, R. H., Private, Co. K, 1st Arkansas Cavalry, aged 18 years. Sabre-cut of the scalp. Osage, Missouri, October 25th, 1864. Admitted to hospital at Fort Scott, Kansas, October 28th. Returned to confinement November 30th, 1864, and subsequently exchanged.

Bryan, George P., 1st Lieutenant, Co. G, 2d North Carolina Regiment. Sabre-cut of the scalp. Upperville, Virginia, June 21st, 1863. Admitted to Stanton Hospital, Washington, June 23d. Sent to Old Capitol Prison August 1st, 1863, and subsequently exchanged.

BUCK, DENNIS M., Sergeant, Co. D, 2d United States Cavalry, aged 32 years. Sabre-cut of the scalp. Trevillian Station, Virginia, June 11th, 1864. Admitted to Finley Hospital, Washington, June 21st. Returned to duty, well, August 22d, 1864.

BURROUGHS, HARMON, Commissary Sergeant, 8th New York Cavalry, aged 17 years. Sabre-cut, four inches in length, over the left parietal region. Beverly Ford, Virginia, June 9th, 1863. Admitted to Lincoln Hospital, Washington, June 10th. Returned to duty July 4th, 1863.

BUTCHER, ROBERT A., Private, Co. H, 82d Pennsylvania Volunteers, of the 3d Brigade, 1st Division, 6th Corps, aged 21 years, received, in an encounter with the enemy's cavalry near Burke's Station, Virginia, on April 6th, 1865, two sabre-cuts over the vertex, parallel to each other, and at right angles to the sagittal suture. The wounds appeared to implicate the scalp only, and were approximated by adhesive plaster, after the hair had been shaven away. The patient was conveyed to

Washington, and entered Harewood Hospital on April 16th. The wounds healed rapidly, and no unpleasant symptoms occurred until May 29th, when he complained of severe headache, accompanied by intolerance of light and sensitiveness to noise. A day or two subsequently the anterior wound reopened, and discharged thin unhealthy pus. An exfoliation was suspected, but no denuded bone could be detected, and under a mild evacuant treatment the headache subsided, and the wound again assumed an healthy aspect. On June 8th, 1865, it had almost entirely healed, and, at his own request, the patient was discharged from the hospital and from the service of the United States. Soon after his admission to Harewood, a photograph of his wounds had been taken, by direction of the surgeon in charge, Brevet Lieut. Col. R. B. Bontecou, U. S. Vols. This is preserved as No. 30 of the first volume of Photographs of Surgical Cases, Army Medical Museum, and is very faithfully copied in the figure on the left of the group of heads in the accompanying plate.

Cain, Patrick, Private, Co. G, 62d New York Volunteers, aged 38 years. Sabre-cut of the scalp. Cold Harbor, Virginia, June 3d, 1864. Admitted to McKim's Mansion Hospital, Baltimore, June 11th. Returned to duty August 3d, 1864.

Campbell, Harrison G., Private of Co. F, 5th United States Cavalry, aged 25 years, was wounded in action near Louisa Court House, Virginia, on May 4th, 1863, and fell into the hands of the enemy. He was exchanged, and sent to Annapolis on the hospital transport State of Maine, and was admitted to the general hospital at that place on May 17th, with two suppurating sabre wounds of the scalp, one over the right parietal eminence, the other behind the left ear. He had headache, with frequent pulse, constipated bowels, and appeared to be very feeble. He was purged, and then ordered good diet, and "whiskey and quinine freely." On May 20th erysipelas attacked the left leg, which had received no injury. Tincture of iodine locally and tincture of the sesquichloride of iron internally were employed to combat this complication. On May 21st there was epistaxis; the pulse was small, at 110; the tongue heavily coated. On the 23d there was diarrhœa, which was controlled by pills of opium and camphor. The next day the pulse had risen to 120, and was soft. The abdomen was tympanitic. Stimulants were freely given. The catheter was resorted to, on account of retention of urine, which was scanty and high colored, and oil of turpentine, in doses of ten drops, thrice daily, was ordered. On the 28th the erysipelatous inflammation had extended up the back and over the right leg. The teeth were covered with sordes. Turpentine, with carbonate of ammonia and whiskey and concentrated nutriment, and tincture of iodine locally, constituted the treatment. On June 6th the erysipelas had extended to the face and throat, and the patient became delirious. He continued in an unconscious state until June 14th, 1863, when he died. Acting Assistant Surgeon J. M. Matlock, who reports the case, ascribes the fatal event to "exhaustion following typhoid erysipelas," and as unconnected with the scalp wounds, which maintained an healthy appearance to the last.

Capron, James P., Sergeant, Co. F, 3d United States Artillery. Sabre-cut of the forehead, and a shell wound of the left side of the neck. Bisland, Louisiana, April 14th, 1863. Discharged from service July 26th, 1864.

Carbough, Daniel, Private, Co. E, 18th Pennsylvania Cavalry, aged 46 years. Sabre-cut of the right parietal region, in a skirmish on the Rapidan, Virginia, November 17th, 1863. Admitted to Douglas Hospital, Washington, November 23d. Transferred to Satterlee Hospital, Philadelphia, November 28th. Returned to duty March 24th, 1864.

Carey, William H., Private, Co. G, 15th New York Cavalry, aged 18 years. Sabre-cut of the scalp. Newmarket, Virginia, December 21st, 1864. Admitted to hospital at Frederick, Maryland, December 23d. Discharged from service May 20th, 1865.

Carney, William, Private, Co. L, 2d New York Cavalry. Sabre-cut of the scalp, and a shell and gunshot wound of the upper third of the right thigh. Aldie, Virginia, June 17th, 1863. Admitted to Hospital No. 1, Annapolis, Maryland, June 22d. Died June 22d, 1863, from the effects of the gunshot injury.

Carper, Philip W., Private, Co. A, 35th Virginia Cavalry. Sabre-cut of the left parietal region; also a wound of the right arm and left hand. Brandy Station, Virginia, June 9th, 1863. Admitted to Second Division Hospital, Alexandria, Virginia, June 10th. Transferred to Old Capitol Prison June 17th, 1863, for exchange.

Carson, W. L., Private, Co. B, 10th New York Cavalry, aged 21 years. Sabre-cut of the scalp. Admitted to Second Division Hospital, Annapolis, Maryland, June 22d, 1863. Discharged from service September 17th, 1864.

Cebutt, George, Private, Co. F, 11th United States Infantry, aged 19 years. Sabre-cut of the right parietal region. Petersburg, Virginia, August 17th, 1864. Admitted to First Division Hospital, Annapolis, Maryland, August 24th. Deserted November 10th, 1864.

Chambers, James M., Private, Co. K, 14th Pennsylvania Cavalry, aged 18 years. Sabre-cut of the scalp. Millwood, Virginia, December 17th, 1864. Admitted to hospital at Annapolis Junction, Maryland, January 4th, 1865. Discharged from service May 30th, 1865.

Chambers, John, Private, Co. I, 1st Michigan Cavalry. Sabre-cut of the left side of the head. Gettysburg, July 1st, 1863. Admitted to Fort Schuyler Hospital, New York Harbor, July 15. Returned to duty August 28, 1863.

Chan, H., Private, Co. F. 2d Georgia Cavalry. Sabre-cut of the head. Admitted to hospital, Petersburg, Virginia, December 10th, 1862. Furloughed December 19th, 1862.

Chantrell, Octave, Private, Co. M, 4th New York Cavalry. Sabre-cut of the scalp and of the right arm. Upperville, Virginia, June 21st, 1863. Admitted to First Division Hospital, Annapolis, Maryland, July 9th, 1863.

Chapman, Samuel, Chaplain, Mosby's command. Sabre-cut of the head. Drancsville, Virginia, April 1st, 1863.

Clemens, A., Private, Co. C, 51st Virginia Infantry. Sabre-cut of the scalp. Opequan Creek, Virginia, September 19th 1864. Admitted to Field Hospital, Winchester, Virginia, September 20th. Transferred for exchange, well, November, 1864.

Bell Watson's Photo Lith

J Bien lith

Private R. A. Burgess
[illegible]

Private J. A. Howard
[illegible]

Private I. K. Rogers
54th Mass. Rebel Inf.

SABRE WOUNDS OF THE HEAD.

CLEMMENS, LAWRENCE, Bugler, Co. I, 1st Massachusetts Cavalry, aged 27 years. Sabre-cut of the scalp. Admitted to Judiciary Square Hospital, Washington, February 20th, 1864. Deserted March 24th, 1864.

Cockrill, Q. J., Private, Co. G, 5th Alabama. Sabre-cut of the head. Petersburg, Virginia, April 2d, 1865. Admitted to Lincoln Hospital, Washington, April 10th. Sent to Old Capitol Prison, April 25th, 1865, for exchange.

COLLEY, JOHN, Private, Co. E, 2d West Virginia Cavalry, aged 20 years. Sabre-cut of the left parietal region. Five Forks, Virginia, April 2d, 1865. Admitted to Slough Hospital, Alexandria, Virginia, June 7th. Discharged from service June 20th, 1865.

COLLVER, EDWARD A., Private, Co. B, 2d New York Cavalry. Sabre-cut of the left occipital region, two and a half inches in length. Brandy Station, Virginia, June 9th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, June 14th. Returned to duty August 10th, 1864.

CONNELLY, THOMAS, Sergeant, Co. I, 1st United States Cavalry, aged 47 years. Sabre-cut of the scalp, and fracture of lower third of the left arm. Waynesboro', North Carolina, September 28th, 1864. Admitted to Chestnut Hill Hospital, Philadelphia, October 9th, and, after several transfers, was admitted to hospital at Carlisle Barracks, Pennsylvania, and discharged from service June 3d, 1865.

CONNER, CHARLES, Private, Co. I, 5th Ohio Cavalry, aged 45 years. Sabre-cut of the scalp. Fayetteville, North Carolina, March 10th, 1865. Admitted to Dennison Hospital, Cincinnati, Ohio, April 15th. Discharged from service July 19th, 1865.

CONOVER, RALPH, Private, Co. H, 18th Pennsylvania Cavalry. Sabre-cuts of the head and neck. Hanover, Pennsylvania, June 30th, 1863. Admitted to Satterlee Hospital, Philadelphia, July 4th. Returned to duty September 23d, 1863.

COREY, LEANDER A., Musician, Co. K, 2d New York Cavalry, aged 21 years. Sabre-cut of the scalp. Admitted to Judiciary Square Hospital, Washington, February 8th, 1864. Returned to duty March 14th, 1864.

CORSTION, ROBERT, Private, Co. H, 1st Michigan Cavalry, aged 19 years. Sabre-cut of the right parietal region. Smithfield, Virginia, August 29th, 1864. Admitted to Jarvis Hospital, Baltimore, Maryland, September 4th. Returned to duty October 1st, 1864.

COUCH, DANIEL, Private, Co. F, 1st Massachusetts Cavalry. Sabre-cut of the scalp, and pistol wound of the abdomen. Aldie, Virginia, June 9th, 1863. Admitted to Armory Square Hospital, Washington, July 3d. Transferred to Lovell Hospital, Portsmouth Grove, Rhode Island, July 8th. Returned to duty September 21st, 1863.

COWLEY, FRANK, Corporal, Co. G, 6th United States Cavalry. Sabre-cut of the scalp. Fairfield, Pennsylvania, July 3d, 1863. Admitted to hospital at Gettysburg July 22d. Returned to duty September 11, 1863.

COYNE, THOMAS, Corporal, Co. B, 10th New York Cavalry. Sabre-cut, two and a half inches in length, over the left occipital region; also a wound of right side of face. Brandy Station, Virginia, June 9th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, June 14th. Returned to duty October 19th, 1863.

Craft, J. H., Private, Co. H, 60th Virginia Infantry. Sabre-cut of the scalp. Opequan Creek, Virginia, September 19th, 1864. Admitted to Field Hospital at Winchester, Virginia, the same day. Transferred for exchange December 10th, 1864, well.

CRANE, JAMES, Private, Co. A, 6th Michigan Cavalry. Sabre-cut of the scalp. Gettysburg, July 1st, 1863. Admitted to Satterlee Hospital, Philadelphia, July 10th. Returned to duty September 23d, 1863.

CROCKER, JAY, Private, Co. D, 10th New York Cavalry. Sabre-cut of the left parietal region, two and a half inches in length, directly over the parietal eminence Brandy Station, Virginia, June 9th, 1863. Admitted to Hospital No. 1, Annapolis, Maryland, June 14th. Returned to duty August 15th, 1863.

CRODON, JOHN, Private, Co. C, 23d Illinois Volunteers. Sabre-cut of the forehead. Annapolis, Maryland, May 21st, 1863. Admitted to First Division Hospital the same day. Returned to duty June 12th, 1863.

CUSACK, WILLIAM, Captain, Co. I, 93th Pennsylvania Volunteers, aged 34 years. Sabre-cut of the forehead over the left eye. Spottsylvania, Virginia, May 8th, 1864. Admitted to Seminary Hospital, Georgetown, District of Columbia, May 12th. Discharged from service July 28th, 1864.

CUTTER, WILLIAM, Private, Co. H, 4th Vermont Infantry, aged 38 years. Sabre-cut of the scalp. Strasburg, Virginia, August 16th, 1864. Admitted to Field Hospital at Sandy Hook, Maryland. August 19th, and transferred to Brattleboro', Vermont, February 6th, 1865, for muster out of service.

DANCER, GEORGE W., Private, Co. A, 6th Michigan Cavalry. Sabre-cut of the scalp. Gettysburg, Pennsylvania, July 1st, 1863. Admitted to Satterlee Hospital Philadelphia, July 10th. Returned to duty August 6th, 1863.

DE GRAW, ISAAC, Private, Co. A, 6th Michigan Cavalry. Sabre-cut of the scalp. Gettysburg, July 1st, 1863. Admitted to Satterlee Hospital, Philadelphia, July 10th. Returned to duty September 23d, 1863.

DE GROOT, HENRY, Private, Co. A, 17th Connecticut Volunteers. Sabre-cut on the left side of the scalp. Admitted to Knight Hospital, New Haven, Connecticut, January 23d, 1864. Transferred to Fort Trumbull February 27th, 1864, for duty.

DELAMATER, H., Corporal, Co. M, 15th New York Cavalry, aged 24 years. Sabre-cut of the scalp. Newmarket, Virginia, December 21st, 1864. Admitted to hospital at Frederick, Maryland, December 23d. Returned to duty January 31st, 1865.

DENHURST, H., Private, Co. D, 17th Connecticut Volunteers. Sabre-cut of the scalp. Gettysburg, July 1st, 1863. Admitted to Seminary Hospital, Gettysburg, same day. Transferred to South Street Hospital, Philadelphia; thence to Knight Hospital, New Haven, Connecticut, on March 24th, 1864. Returned to duty April 21st, 1864.

DODD, THOMAS, Sergeant, Co. B, 6th United States Cavalry. Sabre-cut over the anterior and posterior regions of the scalp. Funktown, Maryland, July 7th, 1863. Admitted to First Divison Hospital, Annapolis, Maryland, August 3d. Returned to duty, well, October 12th, 1863.

DONLIN, JOHN, Private, Co. K, 6th Pennsylvania Cavalry. Sabre-cut of right parietal region. Admitted to First Division Hospital, Annapolis, Maryland, June 14th, 1863. Returned to duty June 17th, 1863.

DOUGHERTY, PATRICK, Private, Co. A, 6th United States Cavalry. Sabre-cut of the left forehead, two inches above the eye. Brandy Station, Virginia, June 9th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, June 14th. Discharged from service October 12th, 1864.

DOUGLAS, JOSEPH, Private, Co. A, 6th Michigan Cavalry. Sabre-cut of the scalp and left shoulder. Gettysburg, July 3d, 1863. Admitted to Hospital No. 1, Annapolis, Maryland, July 16th. Returned to duty July 31st, 1863.

DOWNS, ADAM, Private, Co. G, 1st Pennsylvania Cavalry. Sabre-cut of the scalp. New Hope Church, Virginia, November 27th, 1863. Admitted to Regimental Hospital the same day, and returned to duty December 5th, 1863.

DOYLE, JOSEPH C., Private, Co. A, 1st Alabama Cavalry. Sabre-cut of the scalp, received on Sherman's campaign through the Carolinas, 1865. Mustered out of service with regiment October 20th, 1865.

DOYEA, JOHN, Private, Co. K, 1st Maine Cavalry, aged 22 years. Sabre-cut of the occipital region. Brandy Station, Virginia, June 9th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, June 14th. Returned to duty August 1st, 1863.

DREW, HORACE W., Sergeant, Co. A, 6th Ohio Cavalry, aged 25 years. Sabre-cut, two inches in length, of the right frontal region. Ashland Station, May 12th, 1864. Admitted to Hammond Hospital, Point Lookout, Maryland, May 16th. Transferred to the Veteran Reserve Corps, May 4th, 1865. Mustered out of service August 24th, 1865.

Drew, J. H., Private, Co. F, 45th North Carolina. Sabre-cut of the head. Gettysburg, July 1st, 1863. Admitted to Hospital No. 1, Frederick, Maryland, July 6th. Transferred to Annapolis July 7th, 1863, for exchange.

Dunn, Willis, Private, Co. F, 35th Virginia Infantry. Sabre-cut of the right parietal region. Brandy Station, Virginia, June 9th, 1863. Admitted to Second Division Hospital, Alexandria, Virginia, June 10th. Transferred to Old Capitol Prison, Washington, June 12th, 1863, for exchange.

Ducket, J., Private, Co. E, Thomas's Legion. Sabre-cut of the scalp. Opequan Creek, Virginia, September 19th, 1864. Admitted to Field Hospital, Winchester, Virginia, September 20th. Transferred for exchange December 20th, 1864, entirely well.

Dudley, C. V., 1st Lieutenant, Co. K, 15th Virginia Cavalry, aged 25 years, received several sabre-cuts of the scalp, and one of the right side, at Culpepper, Virginia, September 13th, 1863. Admitted to Lincoln Hospital, Washington, September 17th. Recovered, and was transferred to the Old Capitol Prison October 19th, 1863, for exchange.

DURSTEN, THOMAS, Quartermaster Sergeant, 15th New York Cavalry, aged 20 years. Sabre-cut of the scalp. Newmarket, Virginia, December 21st, 1864. Admitted to hospital at Frederick, Maryland, December 23d. Returned to duty February 1st, 1865.

DUSTAN, GEORGE L., Private, Co. G, 1st Maine Cavalry, aged 25 years. Sabre-cut of the scalp over the occipital region. Brandy Station, Virginia, June 9th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, June 14th. Returned to duty October 25th, 1864.

EDMUNDS, HOWARD, Captain, Co. L, 3d Pennsylvania Cavalry. Sabre-cut of the scalp, and gunshot wound of the shoulder. Gettysburg, July 3d, 1863. Discharged from service August 24th, 1864. His name is not on the Pension List.

EDWARDS, DAVID, Corporal, Co. H, 5th Ohio Cavalry. Sabre-cut of the scalp. Sherman's campaign through the Carolinas, 1865. Mustered out of service October 30th, 1865.

EDWARDS, WILLIAM A., Private, Co. B, 5th United States Cavalry. Sabre-cut of the left parietal region. Chancellorsville, Virginia, May 4th, 1863. Admitted to Second Division Hospital, Annapolis, Maryland, May 19th. Deserted August 7th, 1863.

ELLS, WILLIAM S., Private, Co. K, 9th New York Cavalry. Sabre-cut of the scalp and right arm. Culpepper, Virginia, August 1st, 1863. Admitted to Douglas Hospital, Washington, August 3d. Returned to duty October 10th, 1863.

EYNATTEN, FRANCIS, Sergeant, Co. I, 198th New York Volunteers. Sabre-cut of the face extending from the angle of the mouth to the superior portion of the forehead. Pleasant Hill, Louisiana, April 9th, 1864. He was taken prisoner and admitted to a rebel hospital, and the wound closed with sutures. Discharged from service April 20th, 1866.

FAGLE, FREDERICK, Private, Co. C, 10th New York Cavalry. Two sabre-cuts on the vertex of the scalp, one of the left cheek, and one of the left shoulder. Brandy Station, Virginia, June 9th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, June 14th. Returned to duty May 2d, 1864.

FILLER, JOSEPH, Private, Co. A, 4th New York Cavalry. Sabre-cuts of the scalp and wrist. Upperville, Virginia, June 21st, 1863. Admitted to Emory Hospital, Washington, June 23d. Returned to duty July 25th, 1863.

FINK, ANTHONY, Private, Co. G, 15th New York Cavalry, aged 35 years. Sabre-cut of the scalp. Newmarket, Virginia, December 21st, 1864. Admitted to hospital at Frederick, Maryland, December 23d. Returned to duty January 3d, 1865.

FINNIGAN, W., Private, Co. L, 4th New York Cavalry. Sabre-cut of the scalp. Aldie Gap, Virginia, June 17th, 1863. Admitted to Third Division Hospital, Alexandria, Virginia, June 18th. Furloughed July 22d. Returned to duty August 22d, 1863.

FISHER, CHARLES W., Private, Co. C, 3d Pennsylvania Cavalry. Sabre-cut of the right occipital region while attempting to escape from the patrol guard at Annapolis, Maryland, March 29th, 1863. Admitted to Hospital No. 1, at Annapolis, the same day. Returned to duty April 13th, 1863.

FOLEY, MILES, Sergeant, Co. B, 3d Pennsylvania Cavalry. Sabre-cuts of the scalp and arm. Gettysburg, July 1st, 1863. Admitted to Satterlee Hospital, Philadelphia, July 9th. Returned to duty July 13th, 1863.

FOLSOM, WILLIAM M., Private, Co. E, 5th Wisconsin Volunteers, aged 31 years. Sabre-cut of the scalp and hand. July 20th, 1864. Admitted to Harvey Hospital, Madison, Wisconsin, August 1st. Returned to duty August 7th, 1864.

FOX, ELIAS, Private, Co. G, 15th New York Cavalry, aged 26 years. Sabre-cut of the scalp. Newmarket, Virginia, December 21st, 1864. Admitted to hospital at Frederick, Maryland, December 23d. Returned to duty January 21st, 1865.

FOX, JASPER C., Private, Co. L, 14th Pennsylvania Cavalry, aged 18 years. Sabre-cut of the scalp. Millwood, Virginia, December 17th, 1864. Admitted to McKim's Hospital, Baltimore, January 15th, 1865. Returned to duty March 20th, 1865.

FOSTER, JOSHUA E., Private, Co. M, 6th Pennsylvania Cavalry. Sabre-cut of the right parietal region. Admitted to Second Division Hospital, Annapolis, Maryland, August 21st, 1863. Returned to duty October 14th, 1863.

FRISBIE, SAMUEL, Private, Co. E, Ringgold's Battalion, aged 23 years. Sabre-cut of three inches in length extending diagonally across the parietal region. September 16th, 1863. Admitted to hospital at Cumberland, Maryland, September 16th. Deserted October 16th, 1863.

FRONTMAN, PHILIP, Private, Co. L, 14th Pennsylvania Cavalry, aged 18 years. Sabre-cut of the scalp. Millwood, Virginia, December 17th, 1864. Admitted to Field Hospital, Winchester, Virginia, December 20th. Returned to duty January 17th, 1865.

GARDNER, GEORGE, Private, Co. K, 17th Veteran Reserve Corps, aged 21 years. Sabre-cut of the head. Indianapolis, Indiana, January 5th, 1865. Admitted to City Hospital, in that place, January 12th, from Soldiers' Home. Returned to duty January 23d, 1865.

GARDNER, WILLIAM, Private, Co. H, 15th New York Heavy Artillery, aged 26 years. Sabre-cut of the scalp. South Side Railroad, Virginia, March 31st, 1865. Admitted to White Hall Hospital, Pennsylvania, May 27th, from Lincoln Hospital, Washington. Discharged from service July 22d, 1865.

Gatewood, C. T., Private, Co. F, 9th Virginia Cavalry. Sabre-cut of the scalp. Gettysburg, Pennsylvania, July 1st, 1863. Admitted to hospital at David's Island, New York Harbor, July 17th. Transferred for exchange, well, August 24th, 1863.

GEHRETT, JAMES W., Private, Co. D, 1st Louisiana Artillery, aged 33 years. Sabre-cut of the scalp. Cedar Creek, Virginia, October 19th, 1864. Admitted to McClellan Hospital, Philadelphia, October 24th. Returned to duty November 24th, 1864.

GIDDINGS, BENJAMIN, Private, Co. G, 1st Michigan Cavalry. Sabre-cut of the scalp. Gettysburg, July 3d, 1863. Admitted to Jarvis Hospital, Baltimore, July 19th. Transferred to Carver Hospital, Washington, July 23d. Returned to duty October 20th, 1863.

GILBERT, NAHUM, Sergeant, Co. I, 1st Michigan Cavalry, aged 24 years. Sabre-cut of the head, and a penetrating gunshot wound of the abdomen by a conoidal ball which entered at the umbilicus. Gettysburg, July 1st, 1863. Admitted to Camp Letterman Hospital, Gettysburg, July 6th. Fæcal discharges took place from the wound in the abdomen. Much pain and difficulty in micturition. July 7th, paralysis of lower extremities. August 28th, wounds healed. September 1st, paralysis of lower extremities continues, together with partial paralysis of the rectum. The treatment consisted of compresses and bandage to the abdomen, with diuretics and enemata. Transferred to Mulberry Street Hospital, Harrisburg, September 15th. Discharged from service October 31st, 1863.

GOOD, MARTIN, Private, Co. N, 2d United States Cavalry, aged 22 years. Sabre-cut of the scalp. Beverly Ford, Virginia, June 9th, 1863. Admitted to Satterlee Hospital, Philadelphia, June 23d. Deserted October 1st, 1863.

Goodall, Charles, Private, Co. B, 5th Georgia Cavalry, aged 42 years. Sabre-cut of the left frontal region. Woodbury, Tennessee. Admitted to Hospital No. 1, Murfreesboro, Tennessee, September 6th, and transferred for exchange, well, September 12th, 1864.

Goodman, George N., Private, Co. E, 21st Virginia Cavalry, aged 19 years. Sabre-cut of the scalp. Front Royal, Virginia, November 12th, 1864. Admitted to West's Building Hospital, Baltimore, November 17th. Transferred to Fort McHenry, Baltimore, December 9th, 1864, for exchange.

Graves, William, Private, Co. G, 46th Virginia Infantry, aged 42 years. Sabre-cut of the scalp. Petersburg, Virginia, June 17th, 1864. Admitted to Emory Hospital, Washington, June 24th. Transferred to Lincoln Hospital June 26th, and thence to the Old Capitol Prison for exchange, October 26th, 1864.

Gray, Elijah G., Private, Co. F, 1st Michigan Cavalry, aged 25 years. Sabre-cut of the head, and wound of breast by pistol ball. Gettysburg, July 1st, 1863. Admitted to Satterlee Hospital, Philadelphia, July 9th. Returned to duty December 23d, 1863.

Green, John, Sergeant, Co. D, 18th New York Cavalry, aged 20 years. Sabre-cut of the scalp. Alexandria, Louisiana, April 21st, 1864. Admitted to Marine Hospital, New Orleans, Louisiana, May 23d. Furloughed June 18th, 1864. Deserted August 31st, 1865.

Griffin, Stephen, Private, Co. B, 2d Massachusetts Cavalry, aged 23 years. Sabre-cuts of the scalp and left ear. Rockville, Maryland, July 18th, 1864. Admitted to Campbell Hospital, Washington, July 21st. Transferred thence to Lovell Hospital, Portsmouth Grove, Rhode Island, July 28th. Returned to duty August 23d, 1864.

Griffith, G. W., Private, Co. G, 2d United States Cavalry, aged 23 years. Sabre-cut, an inch and a half long, of the left frontal region. Culpepper, Virginia, August 1st, 1863. Admitted to Douglas Hospital, Washington, August 2d. Returned to duty August 14th, 1863.

Hand, Charles F., Private, Co. F, 2d United States Cavalry. Sabre-cut, two inches in length, of the occipital region. Brandy Station, Virginia, June 9th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, June 14th. Returned to duty October 26th, 1863.

Hanna, John, Private, Co. I, 6th Michigan Cavalry, aged 25 years. Sabre-cut of the scalp. Gettysburg, July 2d, 1863. Admitted to Satterlee Hospital, Philadelphia, July 9th. Returned to duty July 31st, 1863.

Harmon, Martin, Sergeant, Co. I, 9th New York Cavalry. Sabre-cut of scalp. Rapidan, Virginia, October 11th, 1863. Admitted to Regimental Hospital, and returned to duty October 11th, 1863.

Harvey, Joshua, Sergeant, Co. I, 60th Virginia Infantry, aged 40 years. Sabre-cut of the scalp. Winchester, Virginia, September 19th, 1864. Admitted to West's Building Hospital, Baltimore, October 19th. Transferred for exchange, well, October 25th, 1864.

Haskell, David E., Sergeant, Co. F, 8th New York Cavalry. Sabre-cut of the scalp. Beverly Ford, Virginia, June 9th, 1863. Admitted to Lincoln Hospital, Washington, June 11th. Returned to duty June 17th, 1863.

Hazelet, Lewis, Private, Co. L, 14th Pennsylvania Cavalry, aged 38 years. Sabre-cuts of the scalp and arm. Millwood, Virginia, December 17th, 1864. Admitted to McKim's Mansion Hospital, Baltimore, January 15th, 1865, from Field Hospital. Transferred to Mower Hospital, Philadelphia, February 10th. Returned to duty February 23d, 1865.

Higginson, Henry Lee, Major, 1st Massachusetts Cavalry. Sabre-cuts of the scalp and neck. Aldie Gap, Virginia, June 17th, 1863. Admitted to First Division Hospital, Alexandria, Virginia, June 24th. Discharged from service, well, August 9th, 1864.

Hobbs, J. F., Private, Co. M, 1st Rhode Island Cavalry. Sabre-cut of the scalp and right shoulder. Kelley's Ford, Virginia, March 17th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, April 6th. Returned to duty October 5th, 1863.

Hood, Thomas, Sergeant, Co. E, 6th United States Cavalry. Sabre-cut of the scalp. Upperville, Virginia, June 21st, 1863. Discharged July 28th, 1864, on expiration of term of service.

Horsefield, James, Private, Co. K, 73d Indiana Volunteers, aged 49 years. Sabre-cut of the scalp, May 11th, 1864. Admitted to Second Division Hospital, Madison, Indiana, November 28th. Returned to duty March 17th, 1865.

Horton, L. P., Private, Co. L, 10th New York Cavalry. Sabre-cut of the scalp. Virginia, May 11th, 1864.

Hosey, William, Private, Co. A, 8th New Jersey Volunteers, aged 34 years. Sabre-cut of the scalp. Chancellorsville, Virginia, May 3d, 1863. Admitted to Mower Hospital, Philadelphia, April 27th, 1864, from Tilton Hospital, Wilmington, Delaware. Transferred to Trenton, New Jersey, for muster out, August 26th, 1864.

House, Wesley L., Corporal, Co. A, 1st United States Cavalry. Sabre-cut, one inch in length, of the left occipital region. Brandy Station, Virginia, June 9th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, June 14th. Returned to duty December 2d, 1863.

Huckeby, Robert A., Private, Co. I, 53d Georgia Infantry, aged 27 years. Sabre-cut of the scalp. Cedar Creek, Virginia, October 19th, 1864. Admitted to West's Building Hospital, Baltimore, October 24th. Died October 26th, 1864, of "chronic diarrhœa."

Huntley, Ira, Private, Co. C, 2d Kentucky Cavalry, aged 23 years. Three sabre-cuts of the scalp. Cynthiana, Kentucky, June 12th, 1864. Admitted to Seminary Hospital, Covington, Kentucky, June 13th. Meningitis, with serous effusion, supervened, and death resulted on June 21st, 1864.

Ingraham, Chauncey, Private, Co. K, 4th New York Cavalry, aged 23 years. Sabre-cut of the scalp. Upperville, Virginia, June 21st. Returned to duty September 28th, 1863. Received a similar wound at Front Royal, Virginia, August 16th, 1864. Admitted to Camp Parole Hospital, Annapolis, Maryland, October 7th. Deserted, while on furlough, November 18th, 1864.

Jacobs, A. B., Private, Co. H, 6th United States Cavalry. Sabre-cut of the scalp. Fairfield, Pennsylvania, July 3d, 1863. Admitted to Camden Street Hospital, Baltimore, August 29th. Transferred to Cuyler Hospital, Germantown, Pennsylvania, October 27th. Returned to duty December 3d, 1863.

JONES, WILLIAM, Private, Co. L, 6th United States Cavalry. Sabre-cut of the scalp and arm. Fairfield, Pennsylvania, July 3d, 1863. Admitted to West's Building Hospital, Baltimore, July 20th. Transferred to Carver Hospital, Washington, July 24th. Returned to duty September 11th, 1863.

KELLEY, JEFFERSON, Corporal, Co. K, 6th Michigan Cavalry, aged 21 years. Sabre-cut of the scalp and face. Yellow Tavern, Virginia, June 11th, 1864. Admitted to Mt. Pleasant Hospital, Washington, June 21st. Returned to duty September 13th, 1864.

KELLY, JOSEPH, Sergeant, 1st New Jersey Cavalry. Sabre-cut of the scalp. Beverly Ford, Virginia, June 9th, 1863. As no further record can be found of this case, the injury was probably trivial. Mustered out September 16th, 1864.

KEMP, ALFRED, Sergeant, Co. H, 7th Michigan Cavalry. Sabre-cut of the scalp and neck. Gettysburg, July 3d, 1863. Admitted to Jarvis Hospital, Baltimore, July 19th. Transferred to Detroit, Michigan, October 19th. Discharged May 2d, 1864.

KENLY, WILLIAM, Private, Co. F, 4th New York Cavalry. Sabre-cuts of the head and hand. Aldie Gap, Virginia, June 17th, 1863. Admitted to Third Division Hospital, Alexandria, Virginia, June 20th. Discharged from service February 19th, 1864.

KERN, FREDERICK, Private, Co. D, 4th New York Cavalry. Sabre-cut of the scalp and chest. Front Royal, Virginia, August 16th, 1864. Discharged from service June 1st, 1865.

KIDWELL, PHILIP, Private, Co. C, 3d Virginia Mounted Infantry, aged 23 years. Sabre-cut of the scalp. Cumberland, Maryland, July 11th, 1863. Admitted to hospital at Cumberland the same day, and returned to duty November 18th, 1863.

KIERNAN, MICHAEL, Private, Co. A, 6th United States Cavalry. Sabre-cut of the scalp. Upperville, Virginia, June 21st, 1863. Admitted to Emory Hospital, Washington, June 24th. Furloughed July 12th. Returned to duty August 13th, 1863.

KING, SAMUEL, Private, Co. H, 149th Pennsylvania Volunteers, aged 33 years. Sabre-cut of the scalp. Cold Harbor, Virginia, June 1st, 1864. Admitted to Convalescent Hospital, Philadelphia, June 11th. Transferred to Harrisburg, Pennsylvania, September 23d, and returned to duty October 6th, 1864.

Kirby, Andrew H., Private, Beckham's Battalion. Sabre-cut of the scalp. Admitted to Lincoln Hospital, Washington, September 17th, 1863. Transferred for exchange October 19th, 1863.

KIRKPATRICK, WILLIAM, Private, Co. M, 14th Pennsylvania Cavalry, aged 45 years. Sabre-cut of the scalp. Millwood, Virginia, December 17th, 1864. Admitted to Camden Street Hospital, Baltimore, December 22d. Transferred to Philadelphia March 12th, 1865. Discharged from service May 16th, 1865,

KLIM, WILLIAM J., Private, Co. L, 1st Maryland Cavalry. Sabre-cut of the left frontal region. Chambersburg, Pennsylvania, July 23th, 1864. Admitted to York Hospital, Pennsylvania, August 3d. Returned to duty September 15th, 1864.

KNOX, BENJAMIN E., Sergeant, Co. B, 2d New York Cavalry. Sabre-cut, an inch and a half long, over occipital protuberance. Brandy Station, Virginia, June 9th, 1863. Admitted to First Division Hospital, Annapolis, June 14th. Returned to duty October 19th, 1863.

LAGO, WILLIAM, Private, Co. L, 14th Pennsylvania Cavalry, aged 22 years. Sabre-cut of the right side of the scalp. Millwood, Virginia, December 17th, 1864. Admitted to Patterson Park Hospital, Baltimore, March 3d. Returned to duty March 8th, 1865

LEAHY, JOHN, Sergeant, Co. D, 13th Pennsylvania Cavalry. Sabre-cut of the left side of the head. Admitted to Hospital No. 1, Annapolis, Maryland, March 8th, 1863. Deserted April 7th, 1863. Returned from desertion April 30th, 1863, and ordered to report to Colonel Waite, Military Commander at Annapolis.

LEAVITT, FRANK W., Private, Co. E, 1st Maine Cavalry, aged 25 years. Three sabre-cuts on left, centre, and back of the head, and pistol wound through left side of upper lip. Brandy Station, Virginia, June 9th, 1863. Admitted to Hospital No. 1, Annapolis, June 15th. Returned to duty September 13th, 1863.

LEE, JEREMIAH, Private, Co. K, 6th Pennsylvania Cavalry. Sabre-cut of right occipital region. Culpeper, Virginia, June 9th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, June 14th. Transferred to Philadelphia October 3d, 1863. He was discharged, and his application for a pension was rejected May 13th, 1864, his wound having produced no disability.

LEE, THOMAS, Private, Co. C, 14th Pennsylvania Cavalry, aged 22 years. Sabre-cut of the left side of the scalp. Five Forks, Virginia, April 2d, 1865. Admitted to Slough Hospital, Alexandria, Virginia, June 6th. Discharged from service June 29th, 1865. *G. O. No. 77, A. G. O., April 28th*. 1865.

LITTLE, JESSE H , Private Co. B, 18th Pennsylvania Cavalry. Sabre-cuts of the head and shoulder. Hanover, Pennsylvania, June 30th, 1863. Admitted to Satterlee Hospital, Philadelphia, July 9th. Returned to duty January 22d, 1864.

LOCKWOOD, S., Private, Co. K, 1st United States Cavalry. Sabre-cut of the scalp. Upperville, Virginia, June 21st, 1863. Admitted to Emory Hospital, Washington, June 23d. Returned to duty July 13th, 1863.

LOGAN, M. M., Sergeant, Co. M, 16th Pennsylvania Cavalry, aged 21 years. Seven sabre-cuts of the scalp, one of the right shoulder, one of the left forearm, and a pistol-shot wound of the right hip. Aldie, Virginia, June 18th, 1863. Admitted to Lincoln Hospital, Washington, June 21st. Returned to duty January 17th, 1864.

LOTZ, WILLIAM L., Private, Co. L, 1st Pennsylvania Cavalry, aged 17 years. Sabre-cut of the right side of the scalp

Near Richmond, Virginia, May 9th, 1864. Admitted to Hammond Hospital, Point Lookout, Maryland, May 16th. Returned to duty July 19th, 1864.

Lowry, Isaac, Private, Co. C, 11th Georgia Infantry, aged 23 years. Sabre-cut of the scalp. Fisher's Hill, Virginia, October 19th, 1864. Admitted to hospital at Point Lookout, Maryland, January 3d, 1865. Transferred for exchange, well, February 11th, 1865.

Lucas, Willard H., Private, Co. B, 1st Maine Cavalry, aged 28 years. Sabre-cut of scalp. Yellow Tavern, Virginia, May 12th, 1864. Transferred to United States Navy July 4th, 1864.

Lunt, Albert C., Private, Co. I, 1st Vermont Cavalry. Sabre-cut of the left parietal region, two inches above the ear; also one of the vertex. Drainesville, Virginia, April 1st, 1863. Admitted to Hospital No. 1, Annapolis, April 8th. Transferred to Brattleboro', Vermont, July 29th; thence to Bedloe's Island, New York Harbor, November 8th. Returned to duty November 16th, 1863.

Lutes, James W., Private, Co. F, 1st Michigan Cavalry. Sabre-cuts of forehead and vertex of scalp. Gettysburg, July 3d, 1863. Admitted to First Division Hospital, Annapolis, Maryland, July 16th. Returned to duty August 15th, 1863.

Luther, James, Private, Co. G, 8th Illinois Cavalry. Sabre-cut of the scalp. Upperville, Virginia, June 21st, 1863. Recovered, and re-enlisted in the Veteran Reserve Corps. Mustered out of service July 17th, 1865.

Luther, Nicholas, Private, Co. B, 21st Veteran Reserve Corps, aged 49 years. Sabre-cut of forehead. Troy, New York, while on guard. Admitted to hospital at Albany, New York, August 24th. Returned to duty September 26th, 1864.

Lyons, James, Private, Co. E, 18th Pennsylvania Cavalry. Sabre-cut of the scalp. Hanover, Pennsylvania, June 30th, 1863. Admitted to Jarvis Hospital, Baltimore, July 14th, and transferred to First Division Hospital, Annapolis, Maryland, July 16th. Returned to duty August 11th, 1863.

Mack, John, Private, Co. E, 1st Connecticut Cavalry, aged 26 years. Sabre-cut of the scalp. Cedar Creek, Virginia, October 17th, 1864. Admitted to Field Hospital at Sandy Hook, Maryland, October 21st. Transferred to Satterlee Hospital, Philadelphia, October 27th. Returned to duty December 1st, 1864.

Mann, Nehemiah H., Captain, Co. M, 4th New York Cavalry. Sabre-cut of the scalp, and gunshot flesh wound of chest. Upperville, Virginia, June 21st 1863. Admitted to Emory Hospital, Washington, June 23d. Returned to duty September 29th, 1863.

McAlexander, D., Private, Co. G, 21st Virginia Cavalry, aged 18 years. Sabre-cut of the scalp. Front Royal, Virginia, November 9th, 1864. Admitted to West's Building Hospital, Baltimore, November 16th. Transferred for exchange, well, December 9th, 1864.

McCabe, George, Private, Co. C, 2d Maryland Cavalry. Sabre-cut of the left parietal region. Monocacy, Maryland, July 9th, 1864. Admitted to West's Building Hospital, Baltimore, September 3d. Transferred to Fort McHenry, Baltimore, for exchange, well, September 24th, 1864.

McClellan, William T., Private, Co. B, 12th Pennsylvania Cavalry, aged 24 years. Sabre cut of the scalp. Raid on Hamilton, Virginia, March 21st, 1865. Admitted to hospital at Harper's Ferry, Virginia, March 25th. Transferred to Cumberland, Maryland, April 6th. Returned to duty April 24th, 1865.

McCool, Michael H., Sergeant, Co. B, 71st New York Volunteers, aged 30 years. Sabre-cut of the scalp. Chancellorsville, Virginia. May 3d, 1863. Admitted to Turner's Lane Hospital, Philadelphia, March 14th. Discharged from service May 17th, 1864.

McCoy, John, Private, Co. K, 9th Indiana Cavalry, aged 29 years. Incised wound of the scalp. In an affray. Admitted to hospital at Indianapolis, Indiana, April 13th. Returned to duty May 6th, 1864.

McDowell, James, Private, Co. H, 6th United States Cavalry. Sabre-cut of the scalp. Fairfield, Pennsylvania, July 3d, 1863. Admitted to First Division Hospital, Annapolis, Maryland, August 3d. Returned to duty August 15th, 1863.

McFall, Jonathan, Private, Co. A, 6th Michigan Cavalry. Sabre-cuts of the scalp and shoulder. Gettysburg, July 1st, 1863. Admitted to Satterlee Hospital, Philadelphia, July 10th. Returned to duty December 4th, 1863.

McKenna, Davenport, Private, Co. G, 14th Pennsylvania Cavalry, aged 21 years. Sabre-cut of the scalp. Millwood, Virginia, December 17th, 1864. Admitted to Camden Street Hospital, Philadelphia, December 21st. Returned to duty February 23d, 1865.

McKowen, William, Corporal, Co. G, 1st Maryland Cavalry. Sabre-cut of the forehead, and one on the back of the neck. Culpeper, Virginia, September 3d, 1863. Admitted to First Division Hospital, Annapolis, Maryland, September 24th. Returned to duty November 9th, 1863.

McLean, William, Captain, Co. H, 5th United States Cavalry. Two or three sabre-cuts of the posterior portion of the scalp. Hanover, Virginia, June 13th, 1862. Taken prisoner, and confined in Libby Prison, Richmond, for a few weeks, when he was released. Died of inflammation of the brain April 13th, 1863.

McVeigh, T. E., Corporal, Co. F, 15th Virginia Cavalry. Sabre-cut, three inches in length, of the superior occipital region. Brandy Station, Virginia, June 9th, 1863. Admitted to Prince Street Hospital, Alexandria, June 10th. Transferred to provost marshal June 12th, 1863, for exchange.

MEAGHER, EDWARD, Private, Co. M, 6th United States Cavalry. Sabre-cut of the scalp. Fairfield, Pennsylvania, July 3d, 1863. Discharged September 26th, 1864, on expiration of term of service.

MEREDITH, D. H., Private, Co. C, 1st Delaware Cavalry, aged 28 years. Sabre-cut of the scalp; also gunshot wound of the left leg. Westminster, Maryland, June 29th, 1863. Admitted to Tilton Hospital, Wilmington, Delaware, July 4th Transferred to Mower Hospital, Philadelphia, April 27th, 1864. Returned to duty July 11th, 1864.

MIGHT, JOHN, Private, Co. E, 6th United States Cavalry. Sabre-cut of the scalp. Upperville, Virginia, June 21st, 1863. Admitted to Emory Hospital, Washington, June 24th. Returned to duty August 13th, 1863.

MILLER, FRANK E., Sergeant, Co. B, 1st New York Cavalry. Sabre-cuts of the scalp and ear. Dinwiddie Court House, Virginia, March 31st, 1865. Recovered, and mustered out with his regiment June 27th, 1865.

MILLER, JOHN W., Private, Co. L, 14th Pennsylvania Cavalry, aged 22 years. Sabre-cut of the scalp. Ashby's Gap, Virginia, February 9th, 1865. Admitted to hospital at Frederick, Maryland, March 1st, 1865. Discharged from service July 10th, 1865.

MILLS, W. S., Private, Co. F, 1st Michigan Cavalry. Sabre-cut of the scalp and shoulder. Gettysburg, July 1st, 1863. Admitted to Broad and Cherry Streets Hospital, Philadelphia, July 15th. Returned to duty August 12th, 1863.

MONTGOMERY, JOHN, Private, Co. F, 18th Pennsylvania Cavalry, aged 20 years. Sabre-cut of the occipital region. Hanover Junction, Pennsylvania, June 30th, 1863. Admitted to Cuyler Hospital, Germantown, Pennsylvania, July 5th. Returned to duty December 10th, 1863.

MORRIS, J., Private, Co. H, 1st Virginia Artillery, aged 20 years. Sabre wound of the scalp. Lynchburg, Virginia, June 13th, 1864. Admitted to Post Hospital, New Creek, West Virginia, June 20th. Returned to duty July 6th, 1864.

MORTSOLF, MARTIN, Corporal, Co. C, 10th New York Cavalry. Three sabre-cuts—one of forehead, one of right arm, and one of back, extending from left shoulder to right hip. Brandy Station, Virginia, June 9th, 1863. Admitted to Prince Street Hospital, Alexandria, June 10th. Returned to duty July 6th, 1863.

NELLIS, JOHN, Corporal, Co. A, 6th Ohio Cavalry. Sabre-cut of the scalp. Upperville, Virginia, June 21st, 1863.

NELMAN, ——, Private, Co. B, Irish Dragoons, Frémont's Body Guard. Sabre-cut of the scalp and several bruises. Springfield, Missouri, October 25th, 1861. As no further record can be found of this case, the injuries were probably trivial.

NEWKIRK, JAMES C., Private, Co. C, 1st Delaware Cavalry, Sabre-cut of the scalp. Westminster, Maryland, June 29th, 1863. Admitted to Tilton Hospital, Wilmington, Delaware, July 4th. Returned to duty August 25th, 1863.

O'CONNELL, C., Private, Co. C, 5th Illinois Cavalry. Sabre-cut of the scalp. Ellisville, Mississippi, June 23d, 1863. Admitted to First Division Hospital, Annapolis, Maryland, July 15th. Returned to duty September 17th, 1863.

ODELL, CHARLES L., Private, Co. B, 86th New York Volunteers. Sabre-cut of the scalp. Beverly Ford, Virginia, June 9th, 1863. Admitted to Lincoln Hospital, Washington, June 11th. Returned to duty June 24th, 1863.

O'NEIL, THOMAS, Private, Co. I, 1st Maryland Cavalry, aged 24 years. Accidental incised wound of the scalp. Admitted to Jarvis Hospital, Baltimore, March 11th, 1864. Returned to duty April 14th, 1864.

OVERTON, GEORGE P., Private, Co. E, 15th New York Cavalry, aged 41 years. Sabre-cut of the scalp. Newmarket, Virginia, December 21st, 1864. Admitted to hospital at Frederick, Maryland, December 23d. Returned to duty January 21st, 1865.

PALMER, DAVID, Private, Co. K, 6th Ohio Cavalry, aged 19 years Sabre-cut of right occipital region. Yellow Tavern, Virginia, May 12th, 1864. Admitted to hospital at Point Lookout, Maryland, May 16th. Returned to duty June 28th, 1864.

PARCELLS, JOSEPH A., Private, Co. F, 3d Pennsylvania Cavalry, aged 22 years. Sabre-cut of the head, and also over the right clavicle. Gettysburg, July 2d, 1863. Admitted to Chester Hospital, Pennsylvania, July 9th, 1863. Returned to duty December 23d, 1863.

PARRIS, GEORGE W., Private, Co. D, 5th New York Cavalry. Sabre-cut of the scalp. September 13th, 1863. Admitted to Armory Square Hospital, Washington, September 14th. Returned to duty December 4th, 1863.

PATTERSON, JOHN, Private, Co. B, 1st United States Cavalry. Sabre-cut of the right side of the scalp. Upperville, Virginia, June 21st, 1863. Admitted to Hospital No. 1, Annapolis, July 15th. Returned to duty August 15th, 1863.

PHETTEPLACE, MADISON, Private, Co. I, 23d Ohio Volunteers, aged 35 years. Sabre-cut of the scalp. Cedar Creek, Virginia, October 19th, 1864. Admitted to Satterlee Hospital, Philadelphia, October 23d. Transferred to Tripler Hospital, Columbus, Ohio, June 28th. Mustered out of service July 7th, 1865.

PICKETT, THOMAS, Private, Co. I, 2d Maine Cavalry. Sabre-cut of left side of scalp. Pine Barrens, Florida, October, 1864. Admitted to Regimental Hospital, and returned to duty the same day.

POOL, GEORGE S., Private, Co. F, 1st Michigan Cavalry. Sabre-cut of the head and right wrist. Gettysburg, July 1st, 1863. Admitted to Broad and Cherry Streets Hospital, Philadelphia, July 15th. Discharged from service October 3d, 1863.

PORTELL, PATRICK, Private, Co. B, 10th Massachusetts Volunteers. Sabre-cut of the right side of the head, one inch above the frontal protuberance. Gettysburg, July 3d, 1863. Admitted to Satterlee Hospital, Philadelphia, July 5th. Returned to duty April 22d, 1864.

Pullen, T. E., Lieutenant, Co. G, 15th Virginia Cavalry, aged 30 years. Sabre-cut of the occipital region. Admitted to Chimborazo Hospital, Richmond, Virginia, May 17th. Returned to duty June 20th, 1864.

PUTNAM, ORRIN J., Corporal, Co. I, 1st Vermont Cavalry, aged 24 years. Sabre-cut of left side of the scalp. Drainsville, Virginia, April 1st, 1863. Admitted to First Division Hospital, Annapolis, Maryland, April 8th. Transferred to Invalid Corps March 15th, 1864, and mustered out on expiration of his term of service.

PYE, OLIVER, Private, Co. K, 1st New Hampshire Cavalry, aged 37 years. Sword wound of the scalp. Newtown, Virginia, November 12th, 1864. Admitted on the same day to the Cavalry Corps Hospital, and transferred November 20th to McKim's Mansion, Baltimore. Died December 10th, 1864, of "effects of sabre wound."

QUINN, MICHAEL, Bugler, Co. D, 4th United States Cavalry, aged 19 years. Sabre-cut of the scalp. Franklin, Tennessee, November 30th, 1864. Admitted to No. 15 Hospital, Nashville, December 23d. Returned to duty January 4th, 1865.

QUINN, PETER, Private, Co. B, 17th Veteran Reserve Corps, aged 43 years. Severe incised wound of the scalp. Accidental. Admitted to hospital, Indianapolis, Indiana, June 23d, from Ekin Barracks. Returned to duty October 27th, 1864.

REMINGTON, GEORGE W., Captain, Co. H, 2d New York Cavalry, aged 24 years. Sabre-cut of the scalp. Mount Jackson, Virginia, November 22d, 1864. Admitted to Field Hospital at Sandy Hook, Maryland, November 30th. Mustered out on expiration of term of service, June 5th, 1865.

RICE, HORATIO H., Sergeant, Co. A, 10th New York Cavalry, aged 24 years. Sabre-cut of the scalp, and a gunshot flesh wound of the thigh. Trevillian Station, June 11th, 1864. Admitted to Mount Pleasant Hospital, Washington, June 21st, 1864. Transferred to Satterlee Hospital, Philadelphia, June 29th. Discharged December 7th, 1864, on account of expiration of term of enlistment.

Richardson, E., Private, Co. B, 2d Georgia Cavalry. Sabre-cut of the head. Admitted to rebel hospital, Petersburg, Virginia, December 10th, 1862. Returned to duty December 23d, 1862.

Richie, J. R. P., Private, Co. H, 12th Virginia Cavalry. Sabre wound of the head. Admitted to Chimborazo Hospital, Richmond, Virginia, June 12th, 1863. Furloughed June 24th, 1863, for sixty days.

Robinson, Charles E., Private, Co. C, 9th Virginia Cavalry, aged 43 years. Sabre-cut of the parietal region three inches in length. Upperville, Virginia, June 21st, 1863. Admitted to Stanton Hospital, Washington, June 23d. Transferred to Old Capitol Prison August 16th, 1863, for exchange.

ROBINSON, WILLIAM, Commissary Sergeant, 2d Ohio Cavalry. Sabre-cut of the scalp. September, 1864. Mustered out of service September 11th, 1865.

ROGERS, GEORGE A., Private, Co. H, 1st Vermont Cavalry. Sabre-cut of the scalp. Brandy Station, Virginia, October 11th, 1863. Admitted to hospital at Annapolis, October 29th; transferred to Brattleboro, Vermont, December 9th; transferred to Baxter Hospital, Burlington, December 16th. Returned to duty February 25th, 1864.

Rowie, James H., Private, 5th Virginia Cavalry. Sabre-cut of the scalp. Aldie Gap, Virginia, June 17th, 1863. Paroled.

Ruffin, Thomas, Major, 1st North Carolina Cavalry. Sabre wound of the head. Admitted to Hospital No. 4, Richmond, Virginia, July 22d, 1863. Furloughed July 29th, 1863.

RUSSELL, GEORGE, Sergeant, Co. I, 1st Maine Cavalry, aged 21 years. Sabre-cut of the scalp. Sheridan's Raid in Virginia, May, 1864. Discharged the service August 17th, 1864.

RYAN, JEREMIAH, Private, Co. H, 22d New York Cavalry, aged 24 years. Sabre-cut of the scalp. Admitted to De Camp Hospital, David's Island, New York Harbor, June 3d, 1865. Discharged from service July 15th, 1865.

RYAN, SAXEY, Sergeant, Co. G, 13th Indiana Volunteers, aged 23 years. Sabre-cut of the scalp. Bermuda Hundred, Virginia, June 19th, 1864. Admitted to Filbert Street Hospital, Philadelphia, July 6th. Transferred to Satterlee Hospital July 16th. Returned to duty August 6th, 1864.

SALISBURY, FREDERICK, Private, Co. C, 10th New York Cavalry. Sabre-cut of the left parietal region. Beverly Ford, Virginia, June 9th, 1863. Admitted to Second Division Hospital, Annapolis, Maryland, June 14th. Returned to duty July 24th, 1863.

SAUNDERS, EDWARD, Private, Co. M, 7th Michigan Cavalry, aged 18 years. Sabre-cut of the occipital region. Front Royal, Virginia, August 16th, 1864. Admitted to Jarvis Hospital, Baltimore, Maryland, August 21st. Returned to duty September 27th, 1864.

SAXTON, EDWARD P., Private, Co. D, 6th Pennsylvania Cavalry. Sabre-cut of the scalp. Beverly Ford, Virginia, June 9th, 1863. Admitted to Second Division Hospital, Annapolis, Maryland, June 14th. Returned to duty June 18th, 1863.

SCHAEFER, GUSTAVUS, Private, Co. B, 12th Pennsylvania Cavalry. Sabre-cut of the scalp. Gettysburg, July 1st, 1863. Admitted to Satterlee Hospital, Philadelphia, July 9th. Returned to duty August 11th, 1863.

SCHEER, WILLIAM, Private, Co. M, 2d United States Cavalry. Sabre-cut of the right parietal region. Beverly Ford, Virginia, June 9th, 1863. Admitted to Second Division Hospital, Annapolis, June 14th. Returned to duty July 27th, 1863.

SCHIEVILBIEN, EDWARD, Corporal, Co. F, 3d Indiana Cavalry. Sabre-cut of the scalp. Admitted to Field Hospital, Hope's Landing, Virginia, March 23d, 1863. Discharged in consequence of aberation of mind, resulting from the injury, April 12th, 1863.

SECRER, JAMES, Sergeant, Co. C, 1st United States Cavalry. Sabre-cut of the scalp. Upperville, Virginia, June 21st, 1863. Admitted to Tilton Hospital, Wilmington, Delaware, August 12th. Returned to duty October 2d, 1863.

Shaw, C. C., Private, 1st Virginia Cavalry, aged 18 years. Sabre-cut of the left parietal region. Warrenton, Virginia, May 3d, 1863. Admitted to Mansion House Hospital, Alexandria, Virginia, May 3d, 1863. Transferred for exchange, well, June 15th, 1863.

Shepherd, Herbert L., Private, Co. B, 1st Massachusetts Cavalry. Sabre-cut, two inches in length, of the right parietal region, and slight cut of the hand. Manassas Gap, Virginia, June 17th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, July 16th. Returned to duty October 5th, 1863.

Shotwell, John, Sergeant, 5th Kentucky Cavalry. Sabre-cut of the scalp. Sherman's Campaign through the Carolinas, 1865.

Sheffield, John, Private, Co. D, 1st Arkansas Cavalry, aged 18 years. Sabre-cut of the forehead. Osage, Missouri, October 25th, 1864. Admitted to hospital at Fort Scott, Kansas, October 28th. Returned to confinement November 17th, 1864. Subsequently exchanged.

Singleton, William, Private, Co. B, 16th New York Cavalry. Sabre-cut of the scalp. Near Opelousas, Louisiana, October 22d, 1863. Admitted to hospital at New Orleans November 11th. Returned to duty December 3d, 1863.

Skid, John, Private, Co. A, 6th Michigan Cavalry, aged 27 years. Sabre-cut of the scalp. Gettysburg, July, 1863. Admitted to Satterlee Hospital, Philadelphia, July 9th. Returned to duty November 27th, 1863.

Small, John F., Sergeant, Co. H, 1st United States Cavalry. Sabre-cut of the left parietal region. Upperville, Virginia, June 21st, 1863. Admitted to First Division Hospital, Annapolis, Maryland, July 15th. Returned to duty September 26th, 1863.

Smith, George W., Private, Co. D, 1st Michigan Cavalry. Sabre-cut of the scalp. Gettysburg, July 1st, 1863. Admitted to hospital at Gettysburg July 2d. Returned to duty July 9th, 1863.

Smith, Henry M., Private, Co. C, 11th Pennsylvania Volunteers, aged 34 years. Sabre-cut of the scalp. Wilderness, Virginia, May 5th, 1864. Admitted to hospital at Pittsburg June 23d. Returned to duty March 1st, 1865.

Smith, John B., Private, Co. K, 6th Pennsylvania Cavalry. Sabre-cut of the scalp. Beverly Ford, Virginia, June 9th, 1863. As no further record can be found of this case, the injury was probably trivial.

Smith, Patrick, Private, Co. A, 8th New York Cavalry, aged 21 years. Sabre-cut of the scalp. Lacey's Springs, Virginia, December 21st, 1864. Admitted to hospital at Frederick, Maryland, December 23d. Returned to duty January 21st, 1865.

Southerland, Joseph, Private, Co. D, 1st Illinois Artillery, aged 22 years. Sabre-cut of the scalp. December 25th, 1864. Admitted to hospital at Nashville, Tennessee, the same day. Returned to duty January 4th, 1865.

Staff, Isaac, Private, Co. H., 14th Pennsylvania Cavalry. Sabre-cut of the scalp. Millwood, Virginia, December 17th, 1864.

Stanton, C. S., Private, Co. D, 2d United States Cavalry, aged 23 years. Sabre-cut of the scalp. Winchester, Virginia, September 19th, 1864. Admitted to hospital at Frederick, Maryland, October 12th. Returned to duty December 3d, 1864.

Steakem, M., Private, Co. I, 16th Massachusetts Volunteers. Sabre-cut of the scalp. Gettysburg, July, 1863. Admitted to South Street Hospital, Philadelphia, July 8th. Returned to duty July 27th, 1863.

Steinhauser, J., Private, Co. C, 1st United States Cavalry, aged 22 years. Sabre-cut, two and a half inches long, of the right temporal region; also a wound of the thoracic parieties. Culpeper, Virginia, August 1st, 1863. Admitted to Douglas Hospital, Washington, August 2d. Returned to duty October 17th, 1863.

Stellman, Charles, Private, Co. B, 6th Ohio Cavalry. Sabre-cut of the scalp. Beaver Dam, Virginia, May, 1864.

Sterens, Daniel, Private, Co. I, 36th Virginia Infantry, aged 34 years. Sabre-cut of the scalp. Winchester, Virginia, September 19th, 1864. Admitted to West's Building Hospital, Baltimore, October 13th. Transferred for exchange, October 17th, 1864.

Stimpson, Robert E., Private, Co. G, 1st Michigan Cavalry, aged 20 years. Sabre-cut of the head. Gettysburg, July 2d, 1863. Admitted to Satterlie Hospital, Philadelphia, July 9th. Returned to duty September 23d, 1863.

Struble, L. G., Corporal, Co. A, 5th Michigan Cavalry. Sabre-cut of the scalp. Gettysburg, July 1st, 1863. Admitted to Fort Schuyler Hospital, New York Harbor, July 15th. Transferred to De Camp Hospital, David's Island, February 9th, 1864. Returned to duty February 20th, 1864.

Sulham, Jonas G., Private, Co. I, 1st Vermont Cavalry, aged 40 years. Sabre-cut of the left side of head; also gunshot wound of right side of head, and two bruises of right side of scalp by a revolver barrel. Drainesville, Virginia, April 1st 1863. Admitted to Hospital No. 1, Annapolis, April 8th. Returned to duty May 1st, 1863. He was captured June 9th, 1864, and died in a southern prison.

Swain, D. P., Sergeant, Co. A, 6th Michigan Cavalry. Sabre-cut of the scalp. Hunterstown, Pennsylvania. July 2d, 1863. Recovered and returned to duty. Subsequently he was captured, and died in prison at Andersonville, Georgia.

Tarsari, Adolphus, Private, Co. B, 12th New York Cavalry, aged 19 years. Sabre-cuts of the scalp and right hand: September 29th, 1864; for the latter, amputation of the index finger was performed. June 27th, 1865. Admitted to McDougall Hospital, New York Harbor, July 9th. Deserted August 3d, 1865.

Taylor, C. M., Private, Co. D, Jeff. Davis Legion. Sabre-cut of the occipital region; also a gunshot wound of left arm. Upperville, Virginia, June 21st, 1863. Admitted to Stanton Hospital, Washington, June 23d. Transferred for exchange August 1st, 1863.

Tewksbury, Benjamin P., Private, Co. E, 3d New York Cavalry, aged 46 years. Sabre-cut of the head, and contusion of the back by a fall from his horse. Ream's Station, Virginia, June 29th, 1864. Admitted to Balfour Hospital, Portsmouth, Virginia, from Regimental Hospital, May 24th, 1865. Discharged July 20th, 1865.

Thomas, J. W., Sergeant, Co. A, 1st Georgia Cavalry. Sabre-cut of the head. Admitted to hospital at Petersburg, Virginia, November 18th, 1862. Returned to duty December 2d, 1862.

Thompson, C. S., Lieutenant, Co. E, 2d South Carolina Cavalry. Sabre wound of the head. Admitted to Hospital No. 4, Richmond, Virginia, August 6th, 1863. Furloughed August 12th, 1863.

Thompson, John, Private, Co. C, 7th Michigan Cavalry. Sabre-cut of the scalp. Gettysburg, July 3d, 1863. Admitted to First Division Hospital, Annapolis, Maryland, July 16th. Returned to duty August 26th, 1863.

Thompson, William H., Private, Co. K, 18th Alabama Infantry, aged 24 years. Sabre-cut of the scalp. Nashville, Tennessee, December 15th, 1864. Admitted to hospital at Nashville December 25th, 1864. Transferred to Provost Marshal January 3d, 1865, for exchange.

Tomlin, John F., Captain, Co. M., 3d New Jersey Cavalry. Sabre-cut of the scalp. Sailor's Run, Virginia, April 6th, 1865. Admitted to Cavalry Corps Hospital April 11th. Furloughed April 18th. Mustered out of service August 1st, 1865.

Towne. Edward O., Corporal, Co. D, 1st Massachusetts Cavalry, aged 39 years. Sabre-cut, three inches in length, behind the right ear. Aldie, Virginia, June 17th, 1863. Admitted to Third Division Hospital, Alexandria, Virginia, June 18th. Furloughed July 18th, 1863. Returned to duty and mustered out with regiment October 3d, 1864.

Townslee, Giles, Private, Co. A, 6th Michigan Cavalry. Sabre-cuts of the scalp and left arm. Hunterstown, Pennsylvania, July 2d, 1863. Admitted to Satterlee Hospital, Philadelphia, July 10th. Returned to duty September 23d, 1863.

Trauer, William D., Private, Alabama Reserves, aged 47 years. Sabre-cut of the scalp. Milton, Florida, December 24th, 1864. Admitted to St. Louis Hospital, New Orleans, Louisiana, December 28th. Transferred to Military Prison March 11th, 1865, for exchange.

Tweedale, T., Private, Co. I, 1st United States Cavalry. Sabre-cut of the scalp. Upperville, Virginia, June 21st, 1863. Admitted to Emory Hospital, Washington, June 23d. Returned to duty September 11th, 1863.

Updyke, Everett C., Private, Co. D, 10th New York Cavalry. Sabre-cut of the right occipital region, three inches in length. Brandy Station, Virginia, June 9th, 1863. Admitted to Hospital No. 1, Annapolis, June 14th. Returned to duty August 15th, 1863.

Updyke, J. R., Private, Co. B, 5th New York Cavalry. Sabre-cut of the scalp, and gunshot wound of the hip. Hanover, Pennsylvania, June 30th, 1863. Admitted to Fort Schuyler Hospital, New York Harbor, July 15th. Returned to duty August 28th, 1863.

Walker John B., Private, Co. K, 36th Virginia Infantry, aged 38 years. Sabre-cut of the scalp. Winchester, Virginia, September 19th, 1864. Admitted to hospital at Winchester the following day. Transferred to Baltimore December 11th. Sent to Fort McHenry January 5th, 1865, for exchange.

Watson, John, Private, Co. H, 1st Michigan Cavalry. Sabre-cut of the scalp. Gettysburg, Pennsylvania, July, 1863. Admitted to South Street Hospital, Philadelphia, July 8th. Returned to duty July 27th, 1863.

Watts, W. C., Private, Co. D, 14th Virginia Cavalry, aged 26 years. Sabre-cut of the scalp. Front Royal, Virginia, November 12th, 1864. Admitted to Field Hospital, Winchester, Virginia, November 14th. Transferred to Fort McHenry December 9th, 1864, for exchange.

Weed, William H., Private, Co. C, 2d West Virginia Cavalry. Sabre-cut of the scalp. Five Forks, Virginia, April 1st, 1865. Mustered out of service June 3d, 1865.

Wegman. Jacob, Private, Co. I, 16th Illinois Cavalry. Sabre-cut of the scalp. Accident. Admitted to West End Hospital, Cincinnati, Ohio, October 26th. Returned to duty December 19th, 1863.

Welch, Henry L., Private, Co. B, 6th Michigan Cavalry. Sabre-cut of the scalp. Front Royal, Virginia, August 16th, 1864. Deserted June 23d, 1865.

Wentworth, George A., Private, Co. G, 2d Massachusetts Cavalry, aged 24 years. Sabre-cut of the scalp. Aldie, Virginia, July 6th, 1864. Admitted to Third Division Hospital, Alexandria, Virginia, July 12th. Returned to duty September 12th, 1864.

Wilson, Dana S., Private, Co. K, 6th Michigan Cavalry, aged 32 years. Sabre-cut of the scalp. Front Royal, Virginia, August 16th, 1864. Admitted to Field Hospital at Sandy Hook, Maryland, August 18th. Transferred August 20th, 1864. Recovered and returned to duty. Subsequently died of chronic diarrhœa, November 13th, 1865.

Wilson, M. D., Private, Co. H, 14th Virginia Cavalry, aged 20 years. Sabre-cut of the scalp. Front Royal, Virginia, November 12th, 1864. Admitted to Field Hospital, Winchester, Virginia, November 14th. Transferred to Baltimore November 16th, and thence to Fort McHenry, December 9th, 1864, for exchange.

Wingrove. George, Private, Co. F, 9th New York Heavy Artillery. Sabre cut of the right parietal region. Shep

herdstown, Virginia, August 25th, 1864. Admitted to Patterson Park Hospital, Baltimore, August 27th. Transferred to Camp Parole August 29th. Returned to duty October 5th, 1864.

WINTERS, AUGUST, Private, Co. M, 5th Ohio Cavalry, aged 23 years. Sabre-cut of the scalp, and shell wound of the arm. Near Fayetteville, North Carolina, March 10th, 1865. Admitted to Grant Hospital, New York Harbor, March 30th. Transferred to Camp Dennison, Ohio, April 16th. Discharged from service June 23d, 1865.

WOOD, SAMUEL, Sergeant, Co. L, 2d New York Cavalry. Sabre-cuts of the occipital and parietal regions; also wound of neck. Culpepper Court House, Virginia, September 13th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, September 24th. Transferred to De Camp Hospital, New York Harbor, October 29th. Furloughed October 31st. Returned to duty November 21st, 1863.

Woodson, W. R., Private, Co. B, 15th Virginia Cavalry, aged 27 years. Sabre-cut of the occipital region, five inches in length. Brandy Station, Virginia, October 11th, 1863. Admitted to Hammond Hospital, Point Lookout, Maryland, November 8th, from Campbell Hospital, Washington. Transferred for exchange, well, March 3d, 1864.

WRIGHT, JOHN Private, Co. K, 1st Alabama Cavalry. Sabre-cut of the scalp. Sherman's Campaign through the Carolinas, 1865.

WRIGHT, J. N., Private, Co. C, 1st Vermont Cavalry. Sabre-cut of the scalp on median line, three inches above the forehead, and pistol-shot wound of the thorax. Drainesville, Virginia, April 1st, 1863. Admitted to Hospital No. 1, Annapolis, April 8th. Returned to duty May 6th, 1863.

YEAGLE, JOSEPH, Private, Co. L, 5th New York Cavalry, aged 32 years. Sabre-cut of the scalp. Middleburg, Virginia, June 21st, 1863. Admitted to Stanton Hospital, Washington, June 25th. Returned to duty June 29th, 1863.

YOUNG, SETH, Private, Co. D, 1st Massachusetts Cavalry. Sabre-cut of the scalp, and gunshot wound of the left leg. Admitted to Lovell Hospital, Portsmouth Grove, Rhode Island, July 8th. Returned to duty November 18th, 1863.

Of the two hundred and eighty-two cases of incised wounds of the scalp above recorded, six terminated fatally; one hundred and sixty of the officers and men thus wounded were returned to duty, or transferred to the Veteran Reserve Corps for modified duty; one officer resigned; thirty-seven prisoners of war were placed in the custody of the Provost Marshal for exchange or parole; fifty-one United States enlisted men were discharged from service on account of physical disability in a few instances only, and commonly because of the expiration of their terms of enlistment; twelve patients deserted; four were furloughed from Confederate hospitals and did not return, and eleven remain unaccounted for, but undoubtedly recovered without disability, since their names do not appear on the mortuary records or the lists of applications for pensions.

An examination of the record in each individual case indicates that the deserters and furloughed men, and the great majority of the discharged men and exchanged prisoners fully recovered, and that of the whole number of two hundred and eighty-two wounded, three died from some form of encephalitis directly resulting from the injuries received, while in five other cases, chronic diarrhœa, intemperate habits, or intercurrent diseases contracted in hospitals or prisons, were the proximate causes of the fatal issue. Of those discharged for physical disability or invalided or pensioned, two suffered from mental aberration, others from vertigo, imperfect vision, headache, persistent pain at the seat of injury, ptosis, and amaurosis. Of those who recovered and were returned to duty, three were subsequently captured, and died from privation at Andersonville. In short, two hundred and sixty-three of the wounded recovered, eleven were temporarily or permanently disabled, three died from complications, and three from the direct results of the injury.

The treatment of incised wounds of the scalp calls for few comments. Our surgeons commonly shaved a sufficient space about the wound, and after suppressing hæmorrhage, and, if necessary, cleansing the parts and removing foreign bodies, approximated the incised

parts by adhesive plasters.* A compress dipped in cold water and a retentive bandage were usually applied. Some surgeons were not averse to sutures, silver-wire sutures especially, and employed them without disadvantage in cases in which slanting sword cuts had raised flaps of integument. Surgeon S. W. Gross, U. S. V., alludes† to a case which came under his care during the war, but which has not been reported in detail, in which a large semilunar flap, raised from the vertex and side of the head, presented a wound thirteen inches in length. He approximated the wound by nine points of silver suture. On the fourth day, union was perfect. There can be no doubt that exaggerated apprehensions have been entertained with respect to the employment of sutures in wounds of this class; but, as the scalp has but slight elasticity, and retracts but little after division, stitches are rarely indispensable. Neudörfer‡ makes the practical observation that when wounds of the scalp are approximated by adhesive strips the lips are inverted, and the healing of the wound is long delayed by the growth of the hair. On this account he greatly prefers to unite such wounds by points of suture. Hennen and Guthrie and Adams§ also sanction the employment of sutures in scalp wounds where there is much retraction of the edges. Whatever the mode of coaptation adopted, the importance of leaving sufficient intervals for the escape of discharges was generally recognized.

There was not sufficient hæmorrhage in any of the cases above enumerated to require the employment of ligatures. Pressure, which can be so conveniently applied over almost any part of the skull, was adequate to arrest bleeding in every instance.

It does not appear that rest in bed, spare diet, and an antiphlogistic regimen, were often enjoined in this class of cases. It is probable that the unfavorable issue of a certain proportion of the cases was due to the neglect of these precautions. While many military surgeons of the present day call in question the rigid rules of the older surgeons for the general treatment of scalp wounds, and contest the utility of purging, of antimonials, of cold lotions, and of strict diet, none have the hardihood to deny that quiet and abstinence from stimulating food and drink are imperatively demanded in such cases.

Incised Fractures of the Cranium.—Forty-nine cases of incised wounds of the head are recorded on the registers. They furnish illustrations of all the varieties of such injuries: the superficial marking of the outer table, the division of the outer table and diploe, the section of both tables and more or less profound penetration of the cranial cavity, and the separation of an osseous flap.‖

Adams, J. F., Private, Co. G, 21st Virginia Cavalry, aged 34 years. Sabre fracture of the left parietal bone. Front Royal, Virginia, November 12th, 1864. Admitted to hospital at Point Lookout, Maryland, January 31st, 1865. Transferred for exchange. well, February 11th, 1865.

Allen, Robert, Private, Co. I, 4th Kentucky Volunteers. Sabre fracture of the frontal bone over the external portion of the left orbital ridge. Chickamauga, Georgia, September 20th, 1863. Admitted to hospital at Stevenson, Alabama, October 4th, 1863. Returned to duty October 22d, 1863. Mustered out August 21st, 1865.

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* Surgeons in the field were supplied with two kinds of "sticking plaster;" isinglass plaster (Emplastrum Icthyocollæ) and adhesive plaster (Emplastrum Resinæ, U. S. P.) The first was readily detached if water dressings were applied over it; the second was thought by many surgeons to be two irritating to be used in scalp wounds. French surgeons recommend strips of muslin spread with diachylon for the coaptation of these wounds. Strips of linen, secured at the ends by collodion, have also been employed.

† *Review of Works on Military Surgery*, in *Am. Jour. of Med. Sciences*. N. S. Vol. LVI., p. 427, October, 1867.

‡ Neudörfer. *Handbuch der Kriegschirurgie*. Leipzig, 1867. Zweite Hälfte.

§ Hennen. *Military Surgery*, p. 236; Guthrie. *Commentaries on the Surgery of the War*, etc., 6th London ed., p. 337; Adams. *Additions to Cooper's Dictionary*, 8th London ed., p. 374.

‖ The whimsical designations of these accidents by the older surgeons, as *hedra*, (superficial cut;) *ecopé*, (perpendicular cut); *diacopé*, (oblique section); and *aposképarnismos*, (detachment of portions of bone,) have become obsolete.

ARMSTRONG, MARTIN, Sergeant, Co. M, 6th United States Cavalry. Sabre fracture of the cranium. Fairfield, Penn., July 3d, 1863. Admitted to First Division Hospital, Annapolis, Maryland, September 20th. Died October 4th, 1863, of pyæmia.

BASSER, ADAM, Private, Co. F, 6th United States Cavalry, aged 27 years, received a sabre wound of the scalp at Gettysburg, July 3d, 1863. Admitted to hospital at Annapolis, Maryland, August 4th. Transferred to Annapolis Junction, April 9th, 1864; thence to Mower Hospital, Philadelphia, April 27th; thence to Pittsburg, June 7th, where it was found that there was a loosened exfoliation of the outer table of the skull. This was removed; the wound then healed, and the man returned to duty, cured, July 22d, 1864.

B———, JAMES F., Private, Co. F, 7th Michigan Cavalry, was captured at Gettysburg July 3d, 1863, his horse being shot under him. He was hurried to the rear with other prisoners. In the subsequent retreat of the rebel army he was unable to keep up with the column, and, all efforts to goad him on being unavailing, a lieutenant in command of the provost guard cut him down, and left him for dead by the roadside. He was brought in by a scouting party, and was admitted to the Cavalry Corps Hospital. On the 25th of July he was sufficiently rational to give the above account to Surgeon Rulison, 9th New York Cavalry. He was in a very depressed state at this time. His pulse was weak, and beat from forty to fifty per minute. He was indisposed to mental exertion; but when aroused and interested was quite rational. He lingered until August 15th, 1863, the tendency to stupor increasing towards the close. The autopsy revealed a sabre-cut six inches long, which had raised an osseous flap, adherent at its base, from the left parietal, and cloven the right parietal, with great splintering of the vitreous plate. The sabre had penetrated the dura mater on the left side, and on the right side the meninges were injured by the depressed inner table. The posterior lobes of both hemispheres of the brain were extensively disorganized. The specimen, with the above history, was contributed by Surgeon W. H. Rulison, 9th New York Cavalry, since killed in battle. An external view of the specimen is presented in Figure 55, page 40, *Circular* No. 6, Surgeon General's Office, Washington, 1865. An internal view is given in the adjacent wood-cut. (FIG 1.)

FIG. 1.—Interior view of a segment of the parietals and occipital, divided by a sabre-cut.—*Spec.* 1672, Sect. I, A. M. M.

BLOOD, A. N., Corporal, Co. C, 1st New Hampshire Cavalry. Sabre-fracture of the skull. Newtown, Virginia, November 12th, 1864. Admitted to Field Hospital at Winchester, Virginia, on the same day. Inflammation of the brain supervened, and he died, November 30th, 1864.

BRADLEY, ALEXANDER, Private, Co. E, 5th New York Cavalry, aged 23 years. Compound comminuted fracture of the occipital bone by a sabre. Hanover, Pennsylvania, June 30th, 1863. Admitted to Satterlee Hospital, Philadelphia, November 17th. Seventeen spiculæ of bone were removed. Returned to duty November 28th, 1863.

BROWN, JAMES W., Musician, Co. F, 13th Ohio Volunteers, aged 30 years. Sabre-fracture of the cranium. Atlanta, Ga., August 17th, 1864. Admitted to Hospital No. 1, Nashville, Tenn., August 27th. Discharged from service May 18th, 1865.

BROWN, S. L., Private, Co. G, 8th New York Cavalry. Sabre-cut of the scalp, with fracture of the left parietal bone. Gettysburg, July 1st, 1863. A segment of bone removed primarily. Insensibility lasted seven days. Admitted to hospital at York, Pennsylvania, July 19th. Returned to duty November 24th, 1863.

CANFIELD, J. N., Corporal, Co. G, 15th New York Cavalry, aged 55 years. Fracture of the cranium, with depression of the inner table by a blow from a sabre. Newmarket, Virginia, December 21st, 1864. Admitted to hospital at Frederick, Maryland, December 23d. Discharged from service May 20th, 1865.

CLARK, RICHARD, (colored,) officer's servant, aged 19 years. Sword fracture of the left side of cranium. Iceport, Mississippi, February 2d, 1865. Admitted to Strader Hospital, Louisville, Kentucky, March 23d, from Field Hospital. Transferred March 26th, 1865, to New Albany, Indiana, Floating Hospital. Returned to duty June 27th, 1865.

COLVIN, JOHN, Corporal, Co. B, 16th Pennsylvania Cavalry, being detached for service with the provost marshal of the brigade, while in the performance of his duty, received, on January 2d, 1864, a sabre-cut on the forehead. The right parietal bone was badly fractured near the sagittal and frontal sutures. About one square inch of the bone being loose, was removed, together with several spiculæ, and a sharp projection was removed by Hey's saw. The integuments were replaced over the opening in the skull by means of sutures, and the wound healed nearly by first intention. No unpleasant symptom, save one delirious night, occurred after the injury, and the man was returned from the Cavalry Corps Hospital to his regiment on January 28th, 1864. The operation was performed by Dr. George W. Colby, surgeon in chief of the brigade, and the case was reported by Assistant Surgeon A. F. Herrmann.

D——, THOMAS, Private, Co. G, 5th Connecticut Volunteers, aged 48 years, was wounded at Chantilly, Virginia, on September 1st, 1862, by several sabre blows over the right ear. He was taken to Washington, and admitted to Douglas Hospital on September 5th. He was then suffering from partial hemiplegia, with mental hebetude. There was great tumefaction of the scalp. It was found that the right parietal was very extensively fractured, (FIG. 2,) one fissure running near the temporo-parietal suture, and others upwards and backwards from the ear. Near the parietal eminence there was a marked depression. It was determined to raise the depressed bone, and on September 6th, Acting Assistant Surgeon J. W. Williams applied the trephine, and, after removing a button and several fragments of bone, he excised a sharp depressed angle by a Hey's saw. It was ascer-

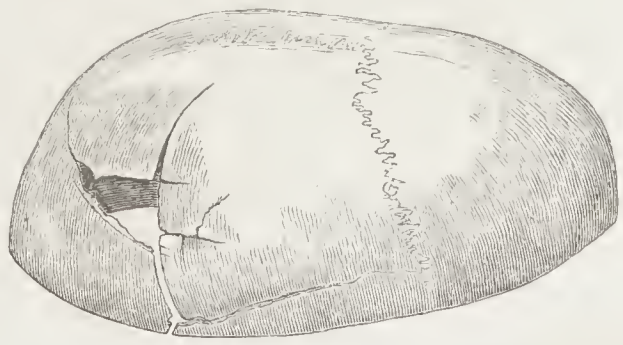

FIG. 2.—Vault of the cranium, showing several sabre-cuts of the right parietal.—*Spec.* 235, Sect. I, A. M. M.

tained that the dura mater had been injured by the sabre-cuts. After the elevation of the depressed fracture, the paralysis of the left side was relieved. The head was shaven, and cold applications were perseveringly employed. For ten days subsequently the case appeared to progress favorably; but, on September 14th, the patient began to be heavy and drowsy, and the following day there were clonic spasms of the left side and pleurosthotonos. At night the breathing was stertorous, the pupils were dilated, and the general symptoms of compression of the brain were very marked. Death took place on September 16th, 1862. There was a large coagulum of extravasated blood under the scalp near the vertex, as though the man had fallen upon his head after being wounded. A *po t mortem* examination was made on September 17th. On removing the calvaria, which was remarkable for its extreme thinness, it was found that the dura mater was perforated beneath the intersection of the wounds, and that, for a space of several inches, there was thickening, with other evidences of inflammatory action. The arachnoid and pia mater were disintegrated in this vicinity, and a space comprising nearly half of the right cerebral hemisphere was occupied by an abscess. The calvaria was forwarded to the Army Medical Museum by Assistant Surgeon Warren Webster, U. S. Army. It is represented by FIG. 2, on the preceding page.

D——, J. M., Private, Co. M, 1st New Jersey Cavalry, aged 24 years, in a skirmish with the retreating enemy, near Burkesville, Virginia, on April 6th, 1865, received a sabre wound on the right side of the head. There was a cut through the scalp and pericranium three inches long, extending into the outer table of the skull and diploe, from the parietal eminence downwards and backwards. The wounded man was conveyed to the Cavalry Corps Hospital, and thence to the Base Hospital at City Point, and thence by water to Baltimore, where he was admitted to West's Building Hospital, on May 11th, 1865. No report of his symptoms is given until his admission to the Baltimore hospital, when Acting Assistant Surgeon W. G. Knowles records that he suffered severe paroxysms of pain, recurring frequently, and announced by loud screams. In the intervals, he answered questions readily and rationally. In the evening of May 11th, he became composed and slept tranquilly. He manifested signs of intelligence until within half an hour of his death, which occurred on May 12th, 1865. On May 13th, thirty-seven days after the reception of the injury, an autopsy was made by Acting Assistant Surgeon J. H. Butler. The incised fracture of the outer table was two and a half inches in length. At one point it penetrated through the diploe. Its edges were necrosed and suppurating. On removing the vault of the cranium, a splinter of the internal table, one and three-fourths of an inch in length and one-quarter of an inch wide, was found under the cut, depressed about two lines. This fragment was covered by a thick deposit of lymph, which filled the angles of the depression, and adhered to the dura mater. In this membrane there were two small perforations, due to ulceration. These communicated with an abscess of the right hemisphere, filled with offensive pus. The dura mater was thickened and softened near the fracture, and discolored on its inner surface over a space an inch in diameter. The specimen is preserved at the Army Medical Museum as a wet preparation, and is numbered 4206 of the Surgical Section. It is represented in the adjacent wood-cuts. (FIG. 3 and FIG. 4.)

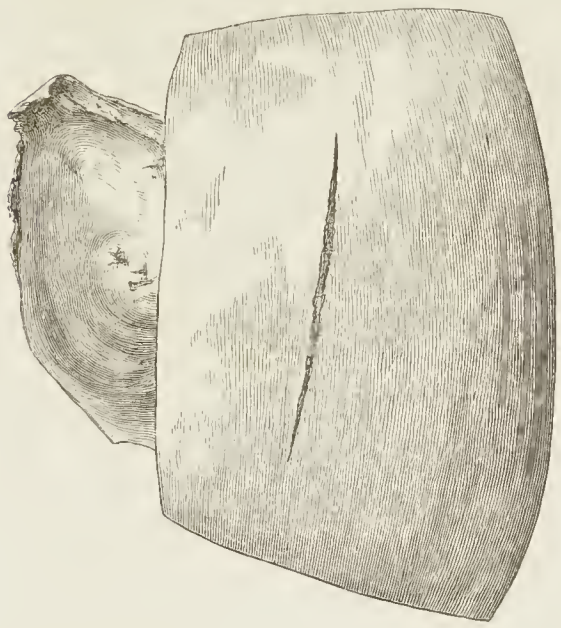

FIG. 3.—Sabre-cut of the right parietal.—*Spec.* 4206, Sect. I, A. M. M.

FIG. 4.—Interior view of the foregoing specimen.

DUNN, GEORGE, Corporal, Co. E, 79th New York Volunteers. Fracture of the left side of the frontal bone, near the coronal suture, by a sabre. There was a depression of both tables of the skull one inch in extent. Admitted to Carver Hospital, Washington, November 30th, 1862. Deserted March 21st, 1863.

ENGLEKEE, WILLIAM, Private, Co. B, 54th Kentucky Volunteers, aged 33 years. Three sabre wounds of the occipital region, and one of the left superciliary ridge. The latter fractured the outer plate of the frontal bone, and destroyed the vision of the left eye. There were also three cuts over the dorsum of the right hand. Saltville, Virginia, December 23d, 1864. Admitted to hospital at Lexington, Kentucky, January 8th, 1865, and discharged from service and pensioned, May 19th, 1865. On March 4th, 1867, the examining surgeon of the Pension Office reported his disabilities as permanent.

FREYBERT, ADAM, Private, Co. B, 1st Maryland Cavalry, aged 34 years. Compound comminuted fracture of the left parietal bone by a blow from a sabre. Brandy Station, Virginia, June 9th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, June 21st. Returned to duty April 21st, 1864. On the expiration of his term of service, he re-enlisted in the 1st Regiment, 1st Army Corps, (Hancock's Corps,) in the spring of 1865. On July 18th, 1865, he was treated at Stanton Hospital, Washington, for catarrh, was furloughed, and then transferred to Douglas, and thence to Harewood Hospitals, and finally discharged on surgeon's certificate of disability, February 21st, 1866. From the hospital records it appears that he suffered little or no inconvenience from his head injury, and that he was probably an incorrigible malingerer.

GODSMARK, GEORGE A., Private, Co. F, 7th Michigan Cavalry, aged 19 years. Sabre-cut of the right parietal region, four inches in length, with partial fracture of the bone. Gettysburg, July 3d, 1863. Admitted to Harewood Hospital, Washington, July

24th, where a spiculæ of bone, one inch in length, was removed. August 18th, the patient was much improved, and the wound was nearly healed. The intellect at times was dull and impaired, with defective hearing. Returned to duty November 11th, 1863.

HAINES, WALTER F., Corporal, Co. K, 1st Maine Cavalry, aged 30 years. Sabre-cut of the scalp, two and a half inches long, with fracture of the vertex of the cranium. Middleburg, Virginia, June 19th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, July 9th. Returned to duty September 13th, 1863.

HALL, ASA A., Private, Co. K, 1st New Hampshire Cavalry, aged 35 years. Sabre-cut of the scalp, injuring the cranium. Lacey's Springs, Virginia, December 21st, 1864. Taken prisoner by the enemy, and admitted to hospital December 25th. Exchanged, and admitted to Patterson Park Hospital, Baltimore, February 26, 1865, from Annapolis. On May 23d fragments of the outer table were removed. Transferred to Hicks Hospital, Baltimore, June 14th. Discharged the service June 25th, 1865. Surgeon T. Sim, U. S. V., reports the case.

H———, ROBERT, Private, Co. C. 6th United States Heavy Artillery,* (colored,) aged 18 years, while sick in hospital at Fort Pillow, Tennessee, received, at the capture of that work, April 12th, 1864, three sabre-cuts over the left parietal bone, and a blow from some blunt weapon, which produced a depressed fracture of the right parietal. One of the sabre wounds fissured the inner table, and drove a portion of it, an inch and a quarter in length, through the dura mater. As he raised his arm to protect his head, he received a sabre-cut on the left hand, nearly severing the index finger. The patient was conveyed by water to the hospital at Mound City, Illinois, and was admitted there on the 14th of April. The case book of the hospital describes him as very low, and at times irrational. On the 17th, the record states that he was weak and very restless, disposed to sleep in the day-time, and it is added that his appetite was tolerably good. On the 18th, he was "very bad." On the 19th, he was at times delirious. He died at half past ten in the morning of April 21st, 1864. At one in the afternoon an autopsy was made by Acting Assistant Surgeon Melvin L. Rust, when a large extravasation of blood was found over the left cerebral hemisphere, and a piece of the vitreous lamina, an inch and a half long and an inch wide, detached from the left parietal by the severest of the sabre-cuts, was driven through the dura mater, into the substance of the brain. The calvaria, which is depicted in the accompanying wood-cut, (FIG. 5,) was forwarded to the Army Medical Museum by Surgeon Horace Wardner, U. S. V. The detached fragment of bone was lost in transportation. The superior portions of the external table of the parietals is discolored, as if from ecchymosis.

FIG. 5.—Sabre-cuts on the back of the skull.—*Spec.* 3307, Sect. 1, A. M. M.

H———, JAMES, Private, 27th Company, 2d Battalion, Veteran Reserve Corps, aged 22 years, a patient at Ricord Hospital, Washington, in an altercation with one of the hospital guards, on the 25th of January, 1865, received a sabre wound, two and a half inches in length, on the left side of the forehead, a little within the left frontal protuberance. A cleft, an inch long, was made in the outer table of the bone. The patient was conveyed into the hospital, and the wound was closed by silver sutures, and simple dressings were applied, and he was restricted to low diet. On the 25th, the man was feverish, and his bowels were constipated. He had a dose of salts, which was repeated on the 27th. On the 28th, he complained of headache, and was ordered a mixture with bromide of potassium, lupulin, and hyoscyamus, and was allowed full diet. On the 31st, the report says that his appetite was good, but he was ordered a drachm of tincture of gentian thrice daily. On February 2d, he was reported as having passed a restless night, and was ordered eight grains of Dover's powder at bedtime. On February 6th, he was very comfortable, and walked about the ward. On the next day, his bowels being sluggish, he took three grains of blue pill and six of the compound extract of colocynth, and was placed on light diet. On the afternoon of the 8th, he complained of headache, which was aggravated at night On the next morning he was partially insensible. He was roused with difficulty; he answered questions slowly, but rationally. The pupils responded to light; the tongue when protruded, after great effort, did not deviate laterally. He had a dose of salts, a blister, three by five, to the nucha, and, later in the day, a terebinthinate enema. He had several involuntary dejections, and his urine dribbled away. In the evening he seemed brighter, and the control of the sphincters was re-established. On February 10th, he was perfectly rational. The urine and fæces were discharged voluntarily; the tongue when protruded deviated slightly to the right; the pulse was weak at 70; slight cephalalgia. February 11th, he had passed a bad night, and he had but little appetite. From the 12th to the 15th, anorexia, weak pulse, regular bowels, no aggravation of the head symptoms. On the 16th, the patient complained of severe headache at 4 A. M., and soon after began to breathe stertorously. At 7 o'clock he was perfectly unconscious; the pupils were slightly but equally contracted, and did not respond

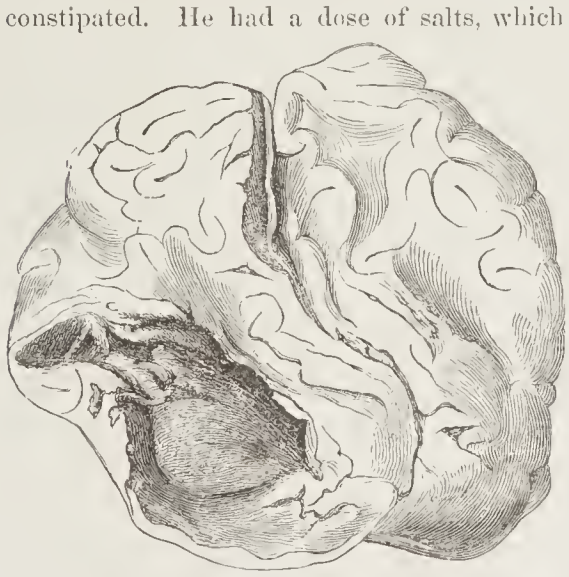

FIG. 6.—Cavity of an abscess in the cerebrum, resulting from a sabre wound.—*Spec.* 3685, Surg. Sect. A. M. M.

* In the brief abstract of this case given at page 40 of *Circular* No. 6, S. G. O., 1865, it is stated that the patient was a private of the 7th Colored Regiment, U. S. Artillery. In the report of the Congressional Committee on the Conduct of the War, (38th Congress, 1st session, House of Representatives, Report No. 65, p. 55,) Robert Hall is named as of the 1st Alabama Artillery. The Adjutant General of the Army informs the compiler that the organization in which this man enlisted was first known as the "1st Alabama Siege Artillery." Its designation was afterwards changed to "6th U. S. Artillery, (colored"), afterwards to "7th U. S. Heavy Artillery," and finally to "11th U. S. Colored Troops."

to light; there was stertor, with foam about the lips. Coma became more and more profound, and at half past twelve on the following day, February 17th, 1865, the patient expired. At the autopsy, an incised fracture, an inch long, involving the outer table only, was found near the left frontal protuberance. The condition of the diploe beneath it is not mentioned. The left side of the os frontis was sent to the Army Medical Museum. It is numbered Specimen 3684 of the Surgical Section, and is figured by a wood-cut on page 34 of the Catalogue.* Two discolored spots on the specimen are stains from iron rust, accidentally made during the preparation of the specimen. An abscess was found in the left anterior lobe of the cerebrum, measuring two and one-half inches antero-posteriorly, and one and one-half inch laterally, the anterior and superior portions extending on the left nearly to the surface of the cerebral substance, and within six lines of the median line of the cerebrum. It contained two ounces of pus. Pus had also found its way through all the ventricles, largely distending the left lateral, and, from the fourth ventricle, had passed between the substance of the medulla oblongata and its membranes as low as the origin of the twelfth nerve. The boundaries of the upper and posterior portions of the abscess are indicated in FIG. 6. Specimen 3571 of the Surgical Section of the Army Medical Museum shows the remaining portion of the abscess.

HINNAN, HENRY, Private, Co. F, 1st New York Mounted Rifles. Sabre-cut of the scalp, with fracture of the external table of the cranium. Suffolk, Virginia, May 17th, 1863. Admitted to Regimental Hospital, and returned to duty in the same month.

HOWARD, JOHN A., Private, Co. G, 21st Pennsylvania Cavalry, aged 24 years, was wounded in the engagement of the 2d Cavalry Division with the enemy near Jettersville, Virginia, April 5th, 1865, by two sabre-cuts, one of the right side of the head, and the other on the back. He was admitted to the Field Hospital of the Cavalry Corps on the day of his injury, when it was ascertained that the wound in the back was not serious, but that the cut on the head, six inches in length, and nearly parallel to the coronal suture, had involved the external table of the parietal bone. The hair was shaven, the wound approximated by adhesive strips, and cold water dressing applied. There were no grave cerebral symptoms, and on April 28th the wounded man was sent to the Base Hospital, at City Point, and thence, on April 30th, to Harewood Hospital, at Washington. A day or two after his admission, a photograph of his wound was made, by direction of Surgeon R. B. Bontecou, U. S. Vols., which is preserved as No. 16 of Volume I, Photographs of Surgical Cases, A. M. M. The middle figure in the preceding lithograph of "Sabre wounds of the head" is a faithful copy of this picture. His case progressing very favorably, Howard was transferred, on May 18th, to Mower Hospital, at Philadelphia. He was mustered out of service on July 18th, 1865, with a pension of six dollars a month. In December, 1867, Howard was living at Shippensburg, Pennsylvania. He writes that he suffers greatly from dizziness, and that there have been several exfoliations from the parietal bones since he went to his home.

HOXEY, MARTIN B., Private, Co. B, 11th Connecticut Volunteers. Fracture of the outer table of the left parietal bone by a sabre-cut. Antietam, Maryland, September 17th, 1862. Admitted to hospital at Frederick, Maryland, October 1st. Insanity was subsequently developed, and he was discharged from service December 23d, 1862.

Hulston, John A., Private, Co. H, Trestoe's Cavalry, aged 20 years, received a sabre fracture of the occipital bone, with penetration of the skull, at Independence, Missouri, October 22d, 1864. Admitted to hospital at Fort Leavenworth, Kansas, October 25th. Died November 5th, 1864.

KAUTNER, CHARLES H., Private, Co. E, 55th Pennsylvania Volunteers, aged 20 years. Sabre fracture of the cranium. Drury's Bluff, Virginia, May 16th, 1864. Admitted to Chesapeake Hospital, Fort Monroe, May 18th. Transferred, June 5th, to De Camp Hospital, David's Island, New York Harbor. Furloughed July 6th, 1864, and did not return.

LAMBERT, JOSEPH C., Corporal, Co. G, 21st Pennsylvania Cavalry. Sabre fracture of the cranium, and incised wound of the left hand. Jettersville, Virginia, April 5th, 1865. Admitted to Cavalry Corps Hospital, April 12th. Transferred to Second Division Hospital at Annapolis, Maryland, April 15th. Returned to duty May 8th, 1865.

Lawler, David E., Sergeant, Co. E, 3d Missouri Cavalry, aged 29 years. Sabre-cut of the left side of the skull, with fracture of the cranium. Little Blue River, Missouri, October 21st, 1864. Admitted to hospital at Fort Leavenworth, Kansas, October 27th, and transferred, on November 13th, 1864, to Post Hospital. He subsequently recovered and was released.

LUCAS, PHILIP, Private, Co. G, 1st New York Cavalry, at Winchester, Virginia, June 13th, 1863, received a sabre fracture of the anterior edge of the occipital bone; also a sabre-cut of the right shoulder, fracturing the head of the scapula. He was discharged from the service on August 24th, 1864, and in May, 1865, was examined by Dr Charles Rowland, Pension Surgeon at Brooklyn, New York, who reported that there was an extensive indentation of the skull, and that Lucas suffered from partial loss of memory, and frequent attacks of vertigo, resulting from his injury.

MAHONEY, DENNIS, Private, Co. C, 132d New York Volunteers, aged 20 years. Incised wound four inches in length, extending from frontal protuberance along the temporal ridge, with fracture of the cranium; also a cut two and one-half inches long in the left parietal region, and the little finger severed, by a sword in the hands of the officer of the guard, April 4th, 1863. Admitted to Foster Hospital, at Newberne, North Carolina, April 5th. Tetanus supervened, and death resulted on April 25th, 1863.

Marshall, Thomas, 7th Virginia Cavalry, aged 34 years. Sabre-cut of the scalp, with fracture of the cranium. Orange Court House, Virginia, August, 1862. Admitted to Old Capitol Prison, Washington. Exchanged September, 1862.

MCGEE, WILLIAM, Orderly Sergeant, Co. F, 1st New York Mounted Rifles. Sabre-cut of the scalp, with fracture of the external table of the cranium. Suffolk, Virginia, May 17th, 1863. Admitted to Regimental Hospital, and returned to duty during the same month.

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* *Catalogue of the Surgical Section of the United States Army Medical Museum*, Washington, 1866, p. 34.

McIntosh, Francis, Private, Co. B, 80th Illinois Volunteers. Sabre-cut of the cranium at the vertex. Day's Gap, Alabama, April 30, 1863. Admitted to First Division Hospital, Annapolis, Maryland, July 3d. Returned to duty September 7th, 1863.

Mosier, Jacob, Private, Co. G, 86th New York Volunteers, aged 21 years. Sabre fracture of the left parietal and occipital bones, while on picket duty at Petersburg, Virginia, October 2d, 1864. Admitted to Armory Square Hospital, Washington, October 29th. Died November 5th, 1864.

Mullen, Charles, Private, Co. D, 69th Pennsylvania Volunteers, received a sabre-cut on the left side of the head at South Mountain, September 14th, 1862. The blow of the sabre was directed obliquely, and inflicted a wound commencing near the left frontal protuberance, extending two inches backwards along the parietal ridge, and downwards over the squamous portion of the temporal, the scalp, muscles, and periosteum, and possibly a portion of the external table being included in the flap. The man fell to the ground senseless. After a primary dressing he was placed in a field hospital, and thence, on October 2d, he was conveyed to Frederick, and admitted to Hospital No. 5, under the charge of Surgeon H. S. Hewit, U. S. Vols. The wound was suppurating profusely at this time. The patient lay in a stupor, and was unable to articulate. It was supposed that he had traumatic meningitis, and the treatment was conducted in accordance with this diagnosis. There was a very gradual amendment; but after several months the mental hebetude disappeared, and the power of speech returned. On January 2d, 1863, the patient was transferred to Hospital No. 1, at Frederick, under the charge of Assistant Surgeon R. F. Weir, U. S. A. At this date, there was an open granulating wound, at the base of which dead bone was exposed; the pericranium was separated from the bone near the margins of the wound. In the middle of March the cranium was exposed to a much greater extent. The patient complained much of headache, and there was partial hemiplegia of the right side. The bare portion of the parietal was necrosed, and was felt to be partly detached. Cataplasms were applied continuously for a few days, when it was decided that the necrosed portion of bone was sufficiently detached to warrant an attempt to remove it. On March 28th, Acting Assistant Surgeon Paullin performed the operation. The entire necrosed part was exposed by an L incision connecting with the wound. The fragment was then seized by forceps, and, by gentle traction, was readily removed. The lips of the wounds were then approximated by adhesive plasters, over which compresses dipped in cold water were applied. The case progressed satisfactorily until April 2d, when the patient had spasmodic movements of the muscles. These ceased upon the removal of a detached, blackened bit of bone, half an inch square, from the anterior portion of the wound. Another small scale of dead bone was extracted on April 10th. In May the patient's general condition was excellent, and the wound was healing rapidly; in the latter part of the month it had closed except at one small point, from which there was a constant purulent discharge. On June 8th, Mullen was discharged from service on account of hemiplegia. His mental faculties were much impaired. The exfoliation which was removed is represented in Fig. 7. Mullen was pensioned at the rate of eight dollars per month. On September 4th, 1867, the examining surgeon of the Pension Office reported that the hemiplegia continued, and that the disability would probably be permanent.

Fig. 7.—Exfoliation from the left parietal, resulting from a sabre wound.—*Spec.* 3863, Sect. I, A. M. M., natural size.

O'Hare, Barney, Private, Co. A, 6th New York Cavalry, aged 35 years, of robust constitution and health, received at the hands of a sentinel, at Camp Scott, Staten Island, New York, November 13th, 1861, a sabre-cut on the left side of the head, extending from near the outer angle of the eye across the temporal region nearly five inches. The squamous portion of the temporal and the parietal were incised for about two inches, and, in the middle of the incision, the bone and subjacent membranes were penetrated. Nearly two drachms of brain substance escaped. The wound was immediately dressed, and there being much cerebral disturbance, and the pulse full and bounding, fifteen grains of calomel were given and twenty-one ounces of blood was taken from the arm, and the eighth of a grain of tartarized antimony was given every two hours. Next morning the man was sitting up, and stated that he was quite comfortable. Surgeon A. P. Clark, 6th New York Cavalry, who reports the foregoing particulars, proceeds to state that the scalp wound healed by first intention, and that on November 22d, 1861, nine days after the reception of the injury, the man returned to duty, and that no subsequent untoward symptoms appeared. O'Hare's name does not appear on the Pension Lists. In October, 1864, he was employed as a blacksmith at the Headquarters of the Army of the Potomac.

Pistorius, William, Private, Co. E, 5th Pennsylvania Cavalry, aged 39 years. Sabre-cut, with fracture and depression of the parietal bone. Petersburg, Virginia, June 9th, 1864. Admitted to hospital at Hampton, Virginia, June 11th. Died June 18th, 1864, from compression of the brain.

Reed, James T., Private, Co. C, 1st Vermont Cavalry, aged 29 years, was wounded in a charge at Boonsboro, Maryland, July 6th, 1863, receiving two sabre cuts, one on the head, the other on the left arm. The first was a slanting cut on the right parietal, which uncovered the dura mater, completely detaching a portion of the bone, the piece of the external table sliced off being two and a half inches in length and an inch and a quarter in breadth, while the portion including the diploe and internal table was much smaller. The integumental flap was not entirely separated from the scalp. The second cut involved the left elbow, and chipped off the olecranon process. The head was shaved on the field; the piece of bone sliced off was separated from the flap, and the integument was replaced and secured by adhesive straps. Water dressings were applied to the wound of the elbow, and the arm was placed in a sling. On July 16th, the patient was admitted to Hospital No. 1, Frederick, Maryland. The wound of the head had almost entirely healed. The elbow was swollen and painful. On July 20th, there was an attack of erysipelas of the arm. This subsided, and the limb was placed, flexed at a right angle, in a starched bandage, the

wound being exposed. There was a copious discharge of pus mixed with synovial fluid. At this date the wound of the scalp was completely healed. On September 20th, the patient had recovered with anchylosis of the elbow. He suffered from headache, and from fixed pain at the seat of the head injury, especially when he was exposed to the sun. On January 23d, 1864, he was transferred to the 1st Battalion of the Veteran Reserve Corps, and on September 26th, 1864, he was discharged from service on account of disability.

Rice, Marcus M., Corporal, Co. K, 1st Vermont Cavalry, aged 39 years, received a sabre fracture of the frontal bone, and a wound of the right thigh, at Gettysburg, July 3d, 1863. Admitted to hospital at Brattleboro, Vermont, August 5th. Returned to duty November 24th, 1863, and mustered out with his regiment on February 22d, 1865.

Rogers, Thomas K., Private, Co. C, 5th Alabama Infantry, aged 41 years, was wounded near Petersburg, Virginia, April 2d, 1865, by a sabre-cut over the left supra-orbital ridge extending upwards and backwards two inches, and fracturing the frontal bone. On April 8th, he was admitted to Lincoln Hospital, Washington. A few days after his admission his photograph was taken for the collection of Photographs of Surgical Cases of the Army Medical Museum. The picture is No. 6 of Volume 3 of that series. It is well copied in the right-hand figure of the group in Plate I. On April 20th, the patient showing symptoms of compression, Surgeon J. Cooper McKee, U. S. Army, applied the trephine about one inch above the supra-orbital ridge and elevated the depressed bone. On May 27th, the patient was recovering rapidly, having manifested no bad symptoms since the removal of the bone. The large incision in the integument was cicatrizing favorably, covering the dura mater, so that pulsation was no longer visible. On June 14th, 1865, the patient had completely recovered, and, upon taking the oath of allegiance, he was released.

Royall, William B., Captain, 5th U. S. Cavalry, received several sabre wounds on June 13th, 1862, near Old Church, Hanover county, Virginia. While posted, in observation, on the extreme right of General McClellan's army, his small command was overwhelmed by the Confederate cavalry column of General J. E. B. Stuart. Captain Royall made a stubborn resistance with his squadron. Though surrounded, and grievously wounded, he escaped from the field. On joining the main body, his injuries were examined by Surgeon C. M. Ellis, 6th Pennsylvania Cavalry. There were two sabre contusions on the right side of the head, a cut two inches long on the forehead through the scalp only, a long cut on the left cheek which bled profusely, a cut on the right wrist dividing the tendon of the extensor proprius pollicis, and an incised fracture four inches long of the left parietal, dividing the outer table and diploe. Entire rest and restricted diet, with cold applications to the head, were enjoined; but after a few days the patient was removed to Washington. Here he was attended by Surgeon General C. A. Finley, and Surgeon G. E. Cooper, U. S. A., who directed a continuance of the antiphlogistic regimen. The flesh wounds soon cicatrized; but the incised fracture continued to suppurate for almost three months, after which the wound firmly healed. A condition of extreme nervous irritability persisted for many months, with attacks of headache and vertigo which incapacitated the sufferer for active service. In May, 1862, Captain Royall was brevetted Major, and in June Lieutenant Colonel, and, in October, he was assigned to duty as mustering officer at Louisville, Kentucky. He was promoted Major December 7th, 1863, and brevetted Colonel March 13th, 1865. In April, 1866, he was examined at the Surgeon General's Office. His health was still impaired from the effects of his injuries, but was gradually improving. In 1869, his health was good.

Shaw, John Henry, Private, Co. I, 10th New York Cavalry, received a sabre-cut of the left side of the scalp, with fracture of the outer table of the frontal bone, at Brandy Station, Virginia, June 9th, 1863. He was admitted to First Division Hospital at Annapolis, Maryland, on June 13th, and returned to duty June 30th, 1863.

Shurey, Amos, Saddler, Co. H, 21st Pennsylvania Cavalry, was wounded by sabre-cuts at the affair at Jettersville, Virginia, April 5th, 1865. The outer tables of the parietal bones were fractured, and also the ulna and fifth metacarpal bone. He was admitted to First Division Hospital, Annapolis, Maryland, April 15th, and on May 9th he was transferred to the Second Division Hospital at Annapolis. He died May 12th, 1865.

Siders, Hiram, Private, Co. H, 21st Pennsylvania Cavalry, aged 18 years. Sabre-cut of the skull, producing a comminuted fracture of the left parietal bone. Amelia Court House, Virginia, April 6th, 1865. Admitted to Carver Hospital, Washington, April 16th. Discharged from service June 21st, 1865.

Steele, Jacob, Private, Co. E, 1st Michigan Cavalry, aged 20 years, received at the battle of Gettysburg, Pennsylvania, July 1st, 1863, three sabre-cuts of the head, fracturing the cranium; also a cut on the neck, a gunshot wound penetrating the left lung, and a wound of the right arm. He was found lying in a barn in a state of insensibility. The ball was removed from the lung, the wounds were dressed, and he was admitted to Camp Letterman Hospital, at Gettysburg, on July 6th. Transferred to Jarvis Hospital, Baltimore, July 19th; thence to West's Buildings, July 21st, and finally to Carver Hospital, Washington, on the 25th. He recovered and returned to duty October 20th, 1863.

Strandburg, Andrew, Private, Co. H, 5th Minnesota Volunteers, aged 42 years, was admitted on December 18th, 1864, to the Cumberland Hospital, at Nashville, Tennessee, for a gunshot wound of the scrotum, received at the battle on the previous day before that city. The wound was not dangerous; but the man had epileptic fits, and it was remarked that there were several depressions in the cranium on the right frontal and parietal regions. The patient stated that he had been wounded several years previously by a sabre blow upon the head, and that he had ever since been subject to convulsions, which were commonly slight, but occasionally severe and frequent. A wounded captain of his regiment stated that the patient's fits had rarely disqualified him for duty. After his admission to hospital, Strandburg had recurrences of epileptic seizures, at first every two or three days, and then at shorter intervals, until at last the intermissions between the attacks were of half an hour's duration only. The intensity of the attacks increased with their frequency. He died in one of the convulsions, January 3d, 1865. At the autopsy, the upper portion of the anterior lobe of the right hemisphere was found to be softened. There was a collection of about two ounces of limpid serum above the right orbital plate of the frontal bone. The brain, in this vicinity, was darker in color than natural. Over the right frontal and parietal regions the dura mater was very firmly attached to the skull. The

right orbital plate was fractured. The calvaria, which was contributed to the Army Medical Museum by the attending medical officer, Surgeon S. C. Ayres, U. S. Vols., exhibited multiple united sabre fractures of the os frontis, and united linear fractures of both parietals, and disjunction of the coronal suture on the right side. Most of the fractures had penetrated the lamina vitrea, which was much thickened in the vicinity of the fractures Several detached fragments of the inner table had reunited, and exhibited an eburnated appearance. Along the sagittal and coronal sutures, and in the neighborhood of the incised fractures, there were osseous deposits of long standing. An internal and external view of the calvaria is presented in the accompanying lithograph.

SWEENEY, D., Private, Co. D, 2d United States Artillery, received several severe sabre-cuts of the scalp, one of which fractured the cranium. November, 1863. Admitted to Douglas Hospital, Washington, November 23d. Returned to duty December 9th, 1863.

VERNOR, FOSTER, Private, Co. E, 1st New York Mounted Rifles, received a sabre-cut of the left parietal region two and a half inches in length, which partially fractured the outer table of the skull. Smithfield, Virginia, May 17th, 1863. Admitted to First Division Hospital, Annapolis, Maryland, May 25th. Returned to duty August 9th, 1863.

Of the forty-nine patients with incised fractures of the cranium above enumerated, forty-four were Union and five Confederate soldiers. Of the whole number, thirteen died, ten were discharged, four were paroled, two deserted, and twenty were returned to duty. In the thirteen fatal cases, death resulted from epilepsy, several years after the reception of the injury, in one instance; in another, tetanus was the cause of death; and, in a third, pyæmia. In the ten remaining fatal cases, death resulted from inflammation of the brain or its membranes, or from compression. In three of the thirteen fatal cases, the fractures were incomplete, extending through the external table and diploe only. Of the ten patients who were discharged for disabilities resulting from sabre fractures of the skull, one became insane, one lost vision in an eye, three suffered from attacks of vertigo or dizziness, and, in two of these, the mental faculties were impaired, loss of memory being particularly noticeable. A sixth patient was hemiplegic, and his mind was much deteriorated. The other four men discharged, and the four paroled men, suffered only from occasional headaches or from slight disabilities. In eleven of the forty-nine patients, fragments of bone were removed by the forceps, elevator, Hey's saw, or trephine. But one of these eleven cases terminated fatally. In thirty-seven cases, the site of fracture is definitely described. The frontal bone was principally involved in seven cases. Two of these terminated fatally; from tetanus, in one instance; in the other, with fracture of the outer table only, secondary encephalitis and abscess of the brain supervened. There were two fractures of the temporal region, which recovered. In twenty-two cases, one or both parietals were fractured, and six of these cases resulted fatally. Of six patients with incised fractures in the occipital region, three recovered and three died. These statistics corroborate the observation of Hennen[1] and others, that sabre wounds on the top of the head are not, by any means, so dangerous as those of the sides. Boyer[2] insisted emphatically on this distinction, citing cases from La Motte, (*Traité de Chir.* Paris, 1732, T. II, p. 238, Obs. 139,) Marchetti, and Bohn, of numerous recoveries from very free incisions of the upper part of the skull, with injury of the membranes or to the brain. He pronounced incised fractures of the lateral parts of the head, with penetration of the brain tissue, far graver, and, indeed, almost invariably fatal accidents. Of two cases of recovery from sabre fractures in the temporal region mentioned in the foregoing return, (*Lawler*, p. 20, and O'HARE, p. 21,) the contents of the cranium were uninjured in one instance, and in the other, the incision ran across the squamo-parietal suture, and the hemisphere was probably wounded at its upper portion. The very rapid recovery in the latter case is sufficiently surprising. In the three cases of recovery from sabre fractures of the occipital region, (BRADLEY, p. 17,

[1] HENNEN, *Principles of Military Surgery*, 3d ed. London, 1829, p. 286.
[2] BOYER, *Traité des Maladies Chirurgicales*, 5e ed. Paris, 1847, T. IV, p. 256.

Engelkee, p. 18, Lucas, p. 20,) there was no evidence of lesions of the encephalon, and in two of these three cases, the incisions appear to have implicated only the outer table and diploe. The seat of injury is specified in eleven of the thirteen fatal cases of incised fractures of the cranium, and was low down laterally or posteriorly in nine.

In five, of the eleven instances in which operative interference was employed in the treatment, it consisted in the early removal of detached or depressed fragments; in three cases, in the extraction of loose exfoliations at a later period; and, in three cases, in the formal application of the trephine.* The five patients treated by the early removal of fragments recovered, and three were returned to duty; one of them, however, suffering from deafness and dullness of intellect; while two were invalided, partly on account of disabilities unconnected with the head injuries. The three patients who had exfoliations removed, eleven, seven, and thirty-two months, respectively, from the date of the reception of their injuries, also recovered, and one was returned to duty, and two were discharged and pensioned; in the former, and one of the latter, necrosis involved the outer table only; the third patient suffered from hemiplegia and mental dullness. Two of the three patients subjected to trephining, on the first and eighteenth day, respectively, recovered; and the third, trephined on the sixth day, survived the operation ten days. These cases will be further considered in the discussion of the results of trephining for gunshot injuries.

When sword-cuts slice away parts of the skull and the detached fragments of bone adhere to flaps of integument not entirely separated from the scalp, the treatment to be pursued has been a subject of discussion from an early period,[1] and is still a disputed question. Denonvilliers and Gosselin,[2] Legouest,[3] and Jamain,[4] advise that the isolated fragment of bone should be removed from the integument, and that the latter should then be replaced and kept in position by adhesive straps if possible, or else by sutures inserted at such intervals as to admit of the free discharge of pus. They follow the teaching of Dupuytren,[5] based on the dangers of protracted suppuration, of necrosis of the detached fragment, and of secondary meningitis, from leaving the bone to act as a foreign body. But these dangers would appear to be overrated, and John Bell, Hennen, Guthrie, and Macleod, were in favor of the practice of Paré, the re-application of the flap, bone and all.

Berengarius de Carpiensis, (*Opera Omnia*, p. 640,) Fallopius, (*De Vulner. Capitis*, Cap. XXII,) and Magatus, report instances of recovery after the removal of the detached section of bone and the re-application of the flap of integument. Larrey and Lombard, (*Remarques sur les Lésions de la Tête*, Strasbourg, 1796,) followed successfully the practice of Berengarius, and cite many interesting cases of recovery from sword cuts in the head, through the bone. Paré (*Œuvres Complètes*, ed. Malgaigne, Book VIII, Chap. 7) advises that the osseous flap should be re-applied and kept in place by a few stitches, a practice which he successfully adopted in the case of 'Captain Hydron," and he quotes

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*Since the foregoing sheets were in print, some additional information has been obtained in relation to the case of S. L. Brown, (p. 17.) The sabre cut ran along the lower border of the left parietal for two and a half inches, and produced a depressed fracture. The patient was conveyed, in an insensible condition, to a field hospital, and was trephined, a button of bone and a detached fragment of both tables, an inch and a half in length, being removed. He was completely unconscious until July 8th, when he recovered from his profound stupor and was perfectly rational. He was kept on a strict antiphlogistic treatment for ten days longer, and was then conveyed to a hospital at York, Pennsylvania.

[1] *Thesavrvs Chirvrgiæ, eontinens præstantissimorvm Avtorvm, vtpote* Ambrosii Parei Parisiensis, Ioannis Tagavlth Ambiani Vimaci, Alphonsi Ferrii Neapolitani, Gvilelmi Fabrith Hildani, etc., *Opera Chirurgica, nunc vere in vnum collecta per* Petrum Uffenbachium. Francofvrti, anno MDCX, p. 199.

[2] *Compendium de Chirurgie Pratique*, T. II, p. 570.

[3] *Traité de Chirurgie d'Armée*, p. 319.

[4] *Manuel de Pathologie et de Clinique Chirurgicales*, 2d ed. Paris, 1867, T. 1, p. 580.

[5] *Clinique Chirurgicale*, T. VI, p. 151.

Celsus (*De re medica*, Liber VIII, Cap. IV) in support of his precept. Sabatier (*De la Méd. Opératoire*, ed. 1832, T. II, p. 18) cites other examples of successful results by Paré's plan from Léaulté,[1] Le Dran, (*Observations de Chirurgie*, T. I, p. 156, Paris, 1731,) and Platner, (*Opuscula, Lipsiae*, 1748.) In the Museum of the Royal College of Surgeons, at London, there are ten skulls, which have suffered from severe slicing cuts. The large portions of bone cleft from these crania have reunited, often a little out of their proper places. The fissures are all in a state of progress towards being filled up by bone; and the patients must have survived their respective injuries months, if not years. These crania are said to have been collected from a cemetery near a military asylum in Germany. Several remarkable examples of the reunion of osseous flaps sliced off by sabre-cuts are preserved in the Museum of the School of Val de Grace. Hennen (*Principles of Military Surgery*, 3d ed., p. 286) saw, in the Peninsula, many cases of this nature successfully treated by replacing the parts with the aid of a few stitches and of a supporting bandage. Macleod records (*Surgery of the War in the Crimea*, p. 181) the case of a Russian soldier under his charge, who recovered perfectly, the osseous flap being left undisturbed. Guthrie (*On Injuries of the Head affecting the Brain*, p. 96) adduces examples of recovery under both methods of treatment, and teaches that when the detached portion of bone adheres firmly to the pericranium or integumental flap, it should be reapplied; but if it has but little adherence, it should be removed.

. The reports of these slanting cuts of the head, with detachment of a flap of bone, in the records of the American war, are insufficient in number and details to decide this question. In the case of Bedel, (*ante* p. 17,) an osseous flap from the occiput, attached to the integument, and partially adherent at its base to the skull, was reapplied, and had nearly reunited through the deposition of new bone, at the date of the man's death, forty-two days after the reception of the injury. Evidently, the presence of the slice of bone in the flap had not been injurious; the fatal issue having been due to the irritation caused by the splinters of the inner table, driven in on the right side. In the case of Strandburg, (p. 22,) illustrated by Plate II, detached fragments had completely reunited, the man surviving his injuries for years. On the other hand, in the cases of S. L. Brown, (p. 17,) and Reed, (p. 21,) the fragments of bone sliced off were removed from the integumental flaps, which were then replaced and retained, and both men made excellent recoveries. Little is known of the practice of Confederate surgeons in this particular. Dr. Chisolm[2] advises that all sabre-cuts should be closed by adhesive strips or sutures, followed by cold water dressings. Dr. E. Warren[3] suggests that the osseous flap should be reapplied; but

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[1] *Observations in Surgery*, written originally in French, by H. F. Le Dran, Senior Master of the Company of Surgeons at Paris. Translated by J. S., 2d ed., London, 1770, p. 77. The XXII Observation, reported by M. Léaulté, sworn surgeon at Paris, relates to a sabre-cut of the occiput, "taking off about the extent of a shilling from the first table of the occipital bone, and from the internal table the bigness of a silver groat, without offending the dura mater, only leaving it uncovered." Léaulté attempted "the reunion of the teguments and the bone." M. Le Dran, "being at Tuernoy with the Mareschal de Villiers, came to visit the patient, and apprehended that it would be necessary to separate the bone from the teguments entirely; but, upon second thoughts, we concluded," says Léaulté, "that I had always time enough to propose this operation, if my former intentions did not succeed; and therefore we agreed to continue the same manner of dressing, which afforded me the satisfaction, in a few days, of approximating the pieces, and securing them so well to the neighboring parts that they perfectly reunited, forming a cicatrix in the space of twenty-five days, without the least accident."

[2] *A Manual of Military Surgery for the use of Surgeons in the Confederate States Army;* by J. JULIAN CHISOLM, M. D., 3d ed., Columbia, S. C., 1864, p. 213.

[3] *An Epitome of Surgery for Field and Hospital;* by EDWARD WARREN, M. D., Richmond, Virginia, 1863, p. 353.

does not present facts in support of the recommendation. The other Confederate surgical writers are silent on the subject.

Although the dangers from permitting the flap of bone adherent to the scalp to remain have, perhaps, been exaggerated, yet it is probably safer to remove it, if it can be detached without much difficulty. That the dangers are not altogether imaginary, is proved by the examples of necrosis of the segment of bone cited by Ravaton and Baerwindt. Should the bone fragment comprise only the outer table and diploe, it seems useless to preserve it; for the brain cavity remains closed by the vitreous table and a flap of scalp alone has, incontestably, a tendency to reunite more promptly than an osseous surface. If the portion of bone sliced off includes the entire thickness of the cranial wall, and is reapplied with the integumental flap, cicatrization must be necessarily slow, and there will be a period of many weeks, during which complications are liable to arise.[1]

Had it been practicable, the cases of incised fractures of the skull would have been arranged in accordance with the classification proposed by Mr. J. Adams,[2] viz: "First, the simple section of the outer table, in which a mere superficial mark is left; secondly, the division of both tables by a perpendicular section; thirdly, an oblique or horizontal cut, where both tables are divided, but not completely detached; and, fourthly, the entire ablation of a piece comprising both tables, in which the bone adheres to the soft parts, or is completely removed with them." But the records are so incomplete that it has been possible to determine these distinctions in only

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[1] The literature of the subject has only been glanced at above. The question seems to have been a favorite topic of discussion with the older surgeons. La Motte (*Traité complet de Chirurgie.* Paris, 1771, pp. 534, 535, 556, 597) recorded four cases (Obs. 140, 141, 157, 161) of slanting sabre-cuts producing osseous flaps, which, in three cases, included both tables of the skull, and in the fourth, the outer table only. In all four cases, the fragments of bone were removed, the integumental flap reapplied, and recovery promptly ensued. Bilguer, J. M., (*Chirurgische Wahrnehmungen in denem Königlich Preussischen Feld Lazarethen,* Berlin, 1763, pp. 89, 114, 143, 145, 147,) cites five cases of the same nature, all of which recovered after the removal of the detached flap of bone, (Obs. 15, 23, 35, 36, 37). D. J. Larrey reports, altogether, eleven cases of this description. (*Relation Historique et Chirurgicale de l'Expédition de l'Armée d'Orient.* Paris, 1803, p. 290; *Clinique Chirurgicale,* Paris, 1829, T. I, pp. 140, 188, 286, 306, et T. V, pp. 11, 40, 322; *Mém. de Chir. Mil. et Campagnes,* Paris, 1812, T. III, pp. 140, 260.) In seven of these cases, the piece of bone sliced off was removed, and six of the patients recovered; in four cases the flap of bone was reapplied, and two patients recovered, and two died. M. H. Larrey (*Relation Chirurgicale des Événemens de Juillet,* 1830, Paris, 1831, p. 35) cites the case of a locksmith, who, supposing himself to be followed by a large body of insurgents, rushed upon a squadron of grenadiers and received eight or ten sabre cuts on his head. There were several flaps; one, including a large portion of the parietal, fell over the right ear, exposing the dura mater over a space two inches long and an inch broad. Another, behind and above the left ear, contained a detached fragment of bone. M. Magistel dressed the wounds, removing entirely the fragments of bone, and adjusting the flaps by sutures and adhesive strips. The patient was then placed in the Beaujon Hospital, under the care of Marjolin and Blandin. Complete recovery followed in about six weeks, and the man was presented to the Academy of Medicine. H. Meyer (*Heilung von Schädverletzungen, in Langenbeck's Archiv.,* B. II, S. 91 und 101. Berlin, 1862) cites two cases of this nature; in one, the severed segment of bone was removed and the patient recovered; in the other, it was replaced, and the patient died of meningitis. The pathological preparation from the latter case is specimen 1052, at the Museum of the University of Zurich. Baerwindt (*Die Behandlung von Kranken und Verwundeten unter Zelten im Sommer* 1866. Würzburg, 1867, S. 93) relates two cases of replacement of the segment of bone, followed by necrosis, the patients recovering after the extraction of the exfoliation. Ravaton (*Chirurgie d'Armée,* Paris, 1768, p. 549) also reports, in detail, two cases with a similar history. Ravoth und Vocke (*Chirurgische Klinik,* Berlin, 1852, S. 437) record two examples of recovery after removal of the osseous flap. B. Beck (*Kriegs-Chirurgische Erfahrungen Während des Feldzuges,* 1866, *in Süddeutschland.* Freiburg, 1867, S. 161) cites a very interesting case of recovery after the removal of a large segment of bone and the reapplication of the flap of integument. On the other hand, Wepfer (*Observations Medico-Practicæ de Affectibvs Capitis,* Scaphusii, 1827, p. 34, Obs. 16) reports a very successful case in which the osseous flap was reapplied. Another is cited by Baudens, (*Clin. des Plaies d'Armes à Feu,* Paris, 1836, p. 122,) a complicated and very unpromising case at the outset. Theden (*Neue Bemerkungen und Erfahrungen,* 1782, Thiel. I, S. 77) approves of replacing the bone. Chopart and Desault (*Traité des Maladies Chirurgicales et des Opérations,* Paris, 1796, p. 70,) are of the same opinion, and C. J. M. Langenbeck (*Nosologie und Therapie Chirurgischen Krankheiten,* Göttingen, 1830. S. 57) inclines in that direction. The authorities are about equally divided; but the facts adduced seem to favor the practice of removing the detached or partially detached segment of bone.

[2] *Additions to the Eighth Edition of Cooper's Dictionary of Practical Surgery,* London, 1861, Vol. I, p. 835.

thirty-one of the forty-nine cases reported. Fifteen cases, of which two were fatal, would be included under the first head; eight cases, four recoveries and four deaths, under the second; six cases, three of which were fatal, under the third; and two cases, a recovery and a death, under the fourth. In only one of the cases reported (R. Hall, p. 19), did the question arise of the treatment to be pursued in the event of a complete ablation of a portion of the skull, together with the integument, the connections of the flap with the head being entirely severed In this case, the complications were so grave that the question was of little interest. It is not impossible that, if the portion of scalp shorn off, the fragment of bone being removed, were immediately replaced, and secured by stitches, reunion might ensue. But no example of such a plastic procedure has been recorded. On the contrary, authors advise that the dressing should be that of a wound with irreparable loss of substance, a simple dressing: for example, a compress spread with cerate and a retentive bandage.

The utility of the trepan in incised fractures of the skull will be considered in the general discussion of the subject of trephining, at the close of this chapter. It will, therefore, be unnecessary to make any further observations on the treatment of incised fractures of the cranium; since, unless it be decided that the symptoms demand operative interference, the treatment should be identical with that of incised scalp wounds. (*See* p. 15.)

The returns confirm the observation of Thomson,[1] renewed by Dr. Macleod,[2] on the remarkable rarity of hernia of the cerebral substance after sword, or compared with gunshot wounds. This complication did not supervene in any of the cases reported, although in many of them the membranes of the brain were divided, while in several there was loss of brain tissue.

In addition to those figured in previous pages of this section, the Army Medical Museum possesses eleven crania affording excellent illustrations of almost every variety of incised fractures of the skull. As these specimens do not pertain to the Surgical History of the American War, the reader must be referred to the Catalogue of the Museum for full descriptions of them.[4]

The three hundred and thirty-one cases of incised wounds of the scalp or cranium recorded in the earlier part of this section, comprise all of the sabre or sword cuts of the head entered on the registers of the Surgeon General's Office that can be satisfactorily

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[1] *Report of Observations made in the British Military Hospitals in Belgium after the battle of Waterloo*, Edinburgh, 1816, p. 50. Thomson cites a remarkable case of removal of the upper part of the occipital bone along with the dura mater, in which "a tendency to protrusion of the brain took place during an attack of inflammation; a slight degree of stupor, with loss of memory occurred; but on the inflammatory state having been subdued the brain sank to its former level, the stupor went off, and the memory returned." Further on, he remarks: "we had frequent opportunities of seeing the upper, and the lateral parts of the cerebrum exposed by sabre wounds; but, in no case, except that which I have mentioned, did any tendency to protrusion of the brain present itself to our notice."

[2] *Notes on the Surgery of the War in the Crimea*, by GEORGE H. B. MACLEOD, M. D., London, 1858, p. 181.

[3] *Report of the Operations of the Medical Department at the Battle of Pea Ridge, Arkansas, on March* 6th, 7th, and 8th, 1862. Bound MSS., S. G. O., Div. Surg. Rec., A. 125.

[4] Specimens 970 and 971, Section I, are crania of Araucanian Indians, killed by Chilian troops. No. 970 shows nine sabre-cuts, illustrating almost every variety of such injuries. It is figured at p. 33 of the *Catalogue of the Surgical Section of Army Medical Museum*. No. 971 shows four cuts, which have sliced off a large portion of the left parietal. No. 5107 is a skull obtained at Waterloo, by Professor William Gibson, and exhibits a long perpendicular cut through the right parietal. Nos. 5249 and 5250, are crania of California Indians, killed near Fort Crook, and exhibit incised fractures of the vault of the skull by the tomahawk. No. 5529 is the skull of a Mataco Indian, showing two clean cross cuts on the vertex, and a deep oblique cleft in the left parietal; the inner table is divided without splintering; the wounds were inflicted by a very sharp sabre. Nos. 5530, 5532, 5534, 5537, are crania of California Indians, showing multiple incised fractures of the vault. No. 5544 is the skull of a Ponka squaw, showing a deep oblique section of the occipital by a sword; the inner table is cleanly divided. The last nine specimens will be fully described in the next edition of the Surgical Catalogue.

verified. Others are alluded to by medical officers, but so indefinitely that identification has been impracticable. Thus, for example, Surgeon D. S. McGuigan,[3] 3d Iowa Cavalry, in his report after the battle of Pea Ridge, refers to several sabre fractures of the skull, which do not appear upon the casualty lists, nor on any of the nominal or numerical returns of wounded:

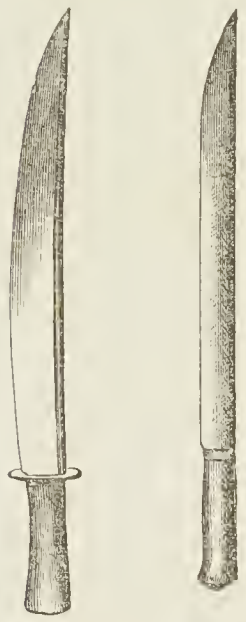

FIG. 8.—Knife or hanger worn by Indian and other savages in the Confederate service in the early part of the American War.*

"The cavalry were pursued by Texan cavalry and mounted Indians, armed with a short and heavy sabre, made from large saw-mill files, and manufactured by their own mechanics. One blow with this rude weapon would crush through the integuments and bony walls of the cranium, into the brain." * * * "The wounds were mainly produced by rifle balls, and by the sword or knife already described. A number were killed by one stroke of this weapon, and I saw several who were severely wounded by it." * * * "The cavalry were wounded more frequently on the upper part of the trunk or the face, upon the head or upper extremities." * * * "Here, too," [at Leetown, Arkansas,] Surgeon McGuigan continues, "I found several wounded by the sabre, two on the head. The integument only was divided in one case, and, in the other, the weapon had penetrated the calvarium, through the prominence of the left parietal bone, in a horizontal direction, and had divided the membranes, through which portions of the cerebral substance protruded. I also found three of our men with sabre-cuts upon the head and upper extremities, and several with minor injuries from the same weapon. These wounded were carried to Cassville, Missouri."[1]

A number of the reports of medical directors and chief medical officers contain remarks on sabre wounds, that will be quoted in the general observations in the concluding volume of this work.

The records of miscellaneous wounds and injuries include no cases of incised fractures of the skull, and but few of incised wounds of the scalp. These cases were commonly entered numerically, on the monthly report, under the rubric "incised wounds," or "vulnus incisum," and rarely by name. The total number of "incised wounds" reported during the four years of the war was twenty-one thousand four hundred and forty-four, with one hundred and ninety-six deaths; but it is impossible to determine how many of these were injuries of the head, since the seat of the wounds is not designated.

The following cases of incised scalp wounds, which it is thought best to separate from the sword wounds, were reported by name:

HUNT, JOHN M., Private, Co. K, 61st Illinois Volunteers, aged 23 years, received an incised wound on the left side of

[1] There is no regimental surgical register of the 3d Iowa Cavalry on file, at the Surgeon General's Office, for the dates referred to. No monthly sick reports for March and April, 1862, were received from the medical officer in charge of the regiment. There are no records on file from Cassville, Missouri, prior to February, 1865. The records of the military hospitals at Rolla, Springfield, Jefferson City, and St. Louis, Missouri, and of Keokuk and Davenport, Iowa, whither wounded were conveyed after the battle of Pea Ridge, have been carefully searched and found not to contain, at the period mentioned, the name of a single wounded man from the 3d Iowa Cavalry. The "Death Registers" and the Casualty Lists of the Medical Director are equally silent respecting the killed and wounded of this regiment at the battle of Pea Ridge. The regimental officers of cavalry had peculiar difficulties in making prompt and accurate returns. When the commands were engaged in scouting and picket duty, they were dispersed in small detachments, and casualties took place of which the regimental surgeon was not cognizant; when they were engaged in expeditions in large columns, or raids, the marches were so rapid that there was little time for clerical work.

* Similar weapons were carried by a large number of the Cofederate soldiers captured at Roanoke Island, February 8th, 1862. These knives were styled by those who wore them: "Yankee-killers." They were from eighteen inches to twenty-four inches in length, and were made from scythe-blades or long files, sharpened to an edge, and set in wooden hilts. They were not used offensively at Roanoke Island, no disposition for hand-to-hand combat being manifested after the intrenched position was carried. The wood-cut is copied from two specimens procured at Roanoke Island, by the compiler of this work.

the head by a knife, at Murfreesboro, Tennessee, March 4th, 1865. He was admitted to hospital on the same day, and returned to duty, cured, on April 11th, 1865.

JACKSON, JOHN, Freedman, was cut on the scalp by a knife, in an affray at Vicksburg, Mississippi, May 8th, 1864. He was received into the Freedman's Hospital, whence he deserted on May 12th, 1864.

LEWIS, JOHN, Private, Co. K, 13th New York Artillery, aged 22 years, received an incised wound of the scalp by a a knife, on April 25th, 1865. He was admitted to Balfour Hospital, Portsmouth, Virginia, on the following day. He was discharged from service on June 17th, 1865.

MCFARLAND, JOHN, Private, Co. I, 8th Ohio Cavalry, aged 25 years, received an incised wound of the scalp by a blow from a knife, on January 7th, 1865. He was admitted to Island Hospital, Harper's Ferry, Virginia, on January 9th, and returned to duty on March 6th, 1865.

SCHUALA, JOSEPH, Private, Co. K, 12th New Jersey Volunteers, aged 32 years, on May 7th, 1865, was struck by a comrade with a knife on the left side of the scalp, producing an incised wound. He was admitted to Lincoln Hospital, Washington, on June 24th, and was discharged from service on July 31st, 1865.

GREEN, F. M., Private Co. H, 45th Kentucky Volunteers, aged 19 years, received an incised wound of the scalp over the superior angle of the parietal bone by a blow from an axe, on December 16th, 1864. He was admitted to hospital at Lexington, Kentucky, on December 21st, and returned to duty on April 1st, 1865, for muster-out of service with his regiment.

LENIHEN, DANIEL, Private Co. F, 20th New York Volunteers, on November 3d, 1864, received a blow on the head from an axe, which produced an incised scalp wound. He was admitted to Lincoln Hospital, Washington, on November 15th, and returned to duty on December 17th, 1864.

SMITH, JOEL, Private, Co. I, 127th New York Volunteers, aged 21 years, was admitted to No. 1 Hospital, Beaufort, South Carolina, on February 21st, 1865, with an incised wound of the scalp, produced by a blow from an axe. He was transferred to hospital at Hilton Head on May 28th, and discharged from service on June 8th, 1865.

WYON, FREDERICK, Private, Co. G, 6th Wisconsin Volunteers, aged 17 years, received an incised wound over the left parietal and occipital regions, by a blow from an axe, on March 5th, 1865. He was admitted to Lincoln Hospital, Washington, on April 4th, transferred thence to Mower Hospital, Philadelphia, on April 7th, and, on May 31st, he was received into the Harvey Hospital at Madison, Wisconsin. He was discharged from service on July 13th, 1865.

In the following examples of incised wounds of the scalp, the nature of the weapon by which the wound was inflicted is not reported:

ABLE, HENRY, Private, Co. A, 107th U. S. C. T., aged 27 years, was admitted to Crittenden Hospital, Louisville, Kentucky, on July 30th, 1865, with an incised wound of the scalp. He returned to duty on July 31st, 1865.

Atlas, George, Private, Co. I, 32d North Carolina Regiment, aged 37 years, received an incised wound of the scalp at Spottsylvania, Virginia, May 10th, 1864. He was received into the Second Division Hospital at Alexandria, on May 14th, and transferred to Lincoln Hospital, Washington, on May 26th, whence he was sent to the Old Capitol Prison on June 1st, 1864.

BOLTON, JAMES, Private, Co. I, 5th Missouri Cavalry, was received into the Post Hospital, Schofield Barracks, St. Louis, Missouri, on September 28th, 1864, with an incised wound of the left side of the head. He returned to duty on October 3d, 1864.

BOWERS, J., Private, Co. H, 12th New York Cavalry, aged 34 years, was admitted to Foster Hospital, Newberne, North Carolina, on September 25th, 1863, with an incised scalp wound. He was returned to duty December 9th, 1863.

BUTTERFIELD, S. H., Unassigned Substitute, aged 18 years, received an incised scalp-wound, and was admitted to hospital at Pittsburg, Pennsylvania, on May 20, 1865. He was discharged from service on May 27th, 1865.

DINNE, MICHAEL, Private, Co., B, 19th Pennsylvania Cavalry, received an incised wound of the scalp on February 22d, 1864, at West Point, Mississippi. He was admitted to Washington Hospital, at Memphis, Tennessee, on February 27th, and returned to duty March 28th, 1864.

GAFFNEY, J., Private, Co. B, 169th New York Volunteers, aged 36 years, received an incised wound of the scalp at Fort Fisher, North Carolina, on January 15ht, 1865. He was admitted to McDougal Hospital, Fort Schuyler, New York, on January 25th, and discharged from service on May 25th, 1865.

HALL, A., Private, Co. A, 169th New York Volunteers, aged 51 years, received an incised wound of the scalp, and was admitted to McDougal Hospital, Fort Schuyler, New York, on June 6th, 1865. He was discharged from service on July 18th, 1865.

HOWARD, JOHN, Private, Co. B, 3d Rhode Island Volunteers, aged 23 years, was admitted to Sickel Hospital, Alexandria, Virginia, on May 5th, 1865, with an incised wound of the scalp. He returned to duty on May 18th, 1865.

JOHNSON, F., Private, Co. E, 39th Ohio Volunteers, aged 19 years, was admitted to Crittenden Hospital, Louisville, Kentucky, on June 25th, 1865, with an incised scalp wound. He was returned to duty on July 18th, 1865.

KELLY, J., Private, Co. D, 2d Louisiana Cavalry, aged 30 years, received, in an affray, a severe incised wound of the scalp. He was admitted to hospital at Baton Rouge, Louisiana, on May 25th, and returned to duty June 13th, 1864.

MCCRACKEN, W. N., Private Co. M, 5th Pennsylvania Heavy Artillery, aged 18 years, received an incised wound of the scalp on October 7th, 1864. He was admitted to 3d Division Hospital, Alexandria, Virginia, on October 10th, and returned to duty January 24th, 1865.

McDonald, F., Private, Co. G, 55th Kentucky Volunteers, aged 29 years, was received into Main Street Hospital, Covington, Kentucky, on April 11th, 1865, with an incised wound of the scalp, not received in action. He died on May 8th, 1865.

Satterwhite, M., Private, Co. A, 44th North Carolina Regiment, received an incised-wound of the scalp on June 26th, 1863. He was admitted to Hospital No. 4, Richmond, Virginia, and furloughed on July 6th, 1863.

Strube, John J., Private Co. K, 178th New York Volunteers, aged 20 years, received an incised scalp-wound, and was admitted to Jefferson Barracks Hospital, St. Louis, Missouri, September 20th, 1864. He was returned to duty on September 27th, 1864.

Varble, Henry, Private, Co. C, 22d Indiana Volunteers, aged 21 years, received an incised scalp wound at Franklin, Tennessee, on November 30th, 1864. He was admitted to Brown Hospital, Louisville, Kentucky, on June 21st, 1865, and mustered-out of service July 24th, 1865.

Williams, A. M., Private, Co. G, 7th Pennsylvania Cavalry, was admitted to Cavalry Corps Hospital at Gallatin, Tennessee, on January 11th, 1865, with an incised wound of the scalp. He was transferred to Nashville on February 25th, and discharged from service July 28th, 1865.

Wyman, Joseph, Lieutenant, Co. H, 9th Minnesota Volunteers, received an incised scalp-wound, and was admitted to Post Hospital, St. Louis, Missouri, on May 19th, 1864. He returned to duty on May 30th, 1864.

Young, H. C., Private, Co. F, 20th Kentucky Volunteers, aged 28 years, received an accidental incised scalp wound, on February 28th, 1865. He was admitted to Brown Hospital, Louisville, Kentucky, on June 7th, 1865. He was furloughed, and returned to duty on July 29th, 1865.

Of these twenty-eight cases of incised wounds of the scalp by various weapons, one resulted fatally. Fifteen of the patients were returned to duty, one deserted, and eleven were mustered out, or paroled, or discharged, not for disability, but because their terms of enlistment had nearly expired.*

Punctured Wounds of the Head.—The experience acquired in the late war confirms the common impression that punctured wounds of the integuments of the cranium, or perforations of the cranial bones by bayonet or lance, or sword thrusts, are rare in modern times. On the infrequent occasions on which they are used offensively, these weapons are commonly directed against the chest or abdomen of an adversary. The majority of punctured wounds of the scalp or skull met with in military practice at the present day, result from accidents, or are inflicted in private quarrels, or by sentinels.

Punctured Scalp Wounds.—Only eighteen cases of this nature are recorded. Nine were inflicted by sentinels, or received in broils or attempts to desert. Nine were received in action.

Armstrong, Ebenezer, Private, Co. K, 86th Illinois Infantry. Bayonet wound of the scalp. Kenesaw Mountain Georgia, June 27th, 1864. Returned to duty.

Ball, Patrick, Private, Co. H, 49th Pennsylvania Volunteers, aged 37 years. Bayonet wound of the scalp. Wilderness, Virginia, May 8th, 1864. Admitted to Emory Hospital, Washington, May 13th. Returned to duty May 16th, 1864.

Blake, Thomas, Private, Co. B, 9th New Hampshire Volunteers. Bayonet wound of the scalp, in an attempt to desert. Admitted to post hospital at Albany, New York, December 26th. Deserted, December 30th, 1863.

Call, John W., Private, Co. D, 8th Regiment, 1st Army Corps, aged 24 years. Bayonet wound of occipital region and of left eyebrow. May 23d, 1865. Admitted to post hospital at Camp Stoneman, May 25th. Returned to duty June 7th, 1865.

Davis, John, Private, Co. G, 2d Maine Volunteers, aged 21 years. Bayonet wound of the right temporal region. Falls Church, Virginia, July 18th, 1861. Patient remained unconscious for eight days. Was returned to duty in October, 1861. On June 27th, 1862, constitutional symptoms were manifested, and he was admitted to Pennsylvania Hospital, Philadelphia, and again returned to duty. On November 18th, 1862, he was admitted to Eckington Hospital, Washington, and discharged the service December 23d, 1862, for partial imbecility and such symptoms as dizziness, faintness, and sensitiveness to pressure over the seat of the wound. He was pensioned at four dollars per month, and on September 13th, 1867, his pension was increased to six dollars per month. The pension examiner at Bangor, Maine, Dr. Jones, reported, February 15th, 1867, that dizziness had increased and was constant, and that the pensioner often fell, and became unconscious. He drew his pension on March 4th, 1869, but his condition at that time is not reported.

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* The total number of incised wounds returned during the four years of the war, on the monthly reports of white troops in the United States service, was twenty-one thousand four hundred and forty-four (21,444,) with one hundred and ninety-six (196) deaths; but there is no means of determining how many of these were injuries of the head.

DUNMORE, GEORGE, Private, Co. E, 4th New Hampshire Volunteers, aged 22 years. Bayonet wound of the scalp. Cold Harbor, Virginia, June 5th, 1864. Admitted to Knight Hospital, New Haven, Connecticut, June 19th. Deserted, June 25th, 1864.

FOX, JOSEPH, Sergeant, Co. G, 148th Pennsylvania Volunteers. Bayonet wound of the scalp. August 25th, 1864. Admitted to Lincoln Hospital, Washington, August 30th. Returned to duty September 21st, 1864.

KOSCHICO, GULTILL, Private, Co. C, 13th Connecticut Volunteers. Bayonet wound of the scalp. March 25th, 1864. Admitted to University Hospital, New Orleans, Louisiana, March 26th. Returned to duty July 1st, 1864.

LAHEY, ANDREW, Private, Co. C, 10th Tennessee Volunteers. Bayonet wound of the scalp. May 4th, 1864. Admitted to Hospital No. 2, Nashville, Tennessee, May 6th. Died from inflammation of the brain, May 6th, 1864.

LENTEMAR, FREDERICK, Corporal, 4th Ohio Battery, aged 27 years, received a punctured wound of the scalp on March 10th, 1865, and was received into Hospital No. 2, at Nashville, Tennessee, on the following day. He recovered, under simple dressings, and was returned to duty March 18th, 1865.

MCCARTY, GEORGE, Private, Co. G, 23d Pennsylvania Volunteers, aged 18 years. Bayonet wound of the scalp. Cold Harbor, Virginia, June 2d, 1864. Admitted to South Street Hospital, Philadelphia, June 13th. Returned to duty July 10th, 1864.

MCDONALD, JOSEPH W., Private, Co. D, 75th Illinois Volunteers, aged 35 years. Bayonet wound of the scalp. Columbus, Georgia, November 24th, 1864. Admitted to Hospital No. 5, Quincy, Illinois, December 8th. Returned to duty February 7th, 1865.

MCGINPSEY, HUGH W., Sergeant, Co. E, 155th Pennsylvania Volunteers, aged 22 years. Bayonet wound of the occipital and parietal regions. October 6th, 1864. Admitted to hospital at Pittsburg, Pennsylvania, the same day. Returned to duty February 25th, 1865.

MCGOVERN, PHILIP, Private, Co. B, 158th New York Volunteers, aged 25 years. Bayonet wound of the scalp. March 28th, 1864. Admitted to hospital, Beaufort, South Carolina, March 28th. Returned to duty April 27th, 1864.

MEADE, MICHAEL, Private, Co. B, 60th New York Volunteers, aged 22 years. Bayonet wound of the scalp. Chickamauga, Georgia, September 20th, 1863. Admitted to Hospital No. 1, Louisville, Kentucky, February 17th. Returned to duty February 22d, 1864.

TOMONEY, EDWARD F., Private, 100th Pennsylvania Volunteers, aged 38 years. Bayonet wound of the scalp. Petersburg, Virginia, April 2d, 1865. Admitted to Slough Hospital, Alexandria, Virginia, April 27th. Deserted May 15th, 1865.

TURNEY, JAMES, Private, Co. K, 105th Pennsylvania Volunteers, received a bayonet wound of the side of the scalp at Fair Oaks, Virginia, May 31st, 1862. He was sent to the rear and admitted to the Hospital at Mills Creek, on June 4th, 1862. The patient died on June 13th, 1862. The particulars of the treatment are not recorded. The case is reported by Surgeon A. P. Heichhold, 105th Pennsylvania Volunteers.

WARNER, GEORGE, Private, Co. I, 1st Veteran Reserve Corps, aged 21 years. Bayonet wound of the scalp. March 25th, 1865. Admitted to hospital at Elmira, New York, April 4th. Returned to duty.

Of the eighteen patients with punctured scalp wounds, eleven were returned to duty; three deserted; one was discharged for disability; and two died. Punctured wounds of the scalp, when made by a weapon directed perpendicularly to the skull, are necessarily slight in depth; when made obliquely, the point of the weapon soon penetrates from within outwards, on account of the convexity of the cranial vault. They are occasionally complicated by erysipelas, burrowing of pus under the occipito-frontalis aponeurosis, or by hæmorrhage; but are commonly trivial in extent and importance. When uncomplicated, the treatment consists in shaving the surrounding scalp and keeping the wound covered with a compress saturated with cold water or some resolvent lotion. The complications which existed in the two fatal cases above noted are not reported in detail.

PUNCTURED FRACTURES OF THE CRANIUM.—Only six examples of punctured fractures of the skull, by sharp-pointed weapons, have been reported. Five of these were inflicted by the bayonet, and one by a sword.

ALLEN, D. K., Private, Co. F, 50th Ohio Volunteers, aged 20 years, received a punctured bayonet wound of the scalp, with fracture and depression of the left parietal bone, at Franklin, Tennessee, November 30th, 1864. Admitted to Dennison Hospital, Cincinnati, Ohio, January 18th, 1865, from Madison Hospital, Indiana. Temporary insensibility, paralysis of right arm, and aphonia, followed the injury. A portion of the bone, one and a half inches in length and three-fourths of an inch in breadth, was removed. The wound healed, the scalp adhering to the dura mater. Furloughed March 16th, 1865, and never returned to hospital. He was examined by Surgeon John C. Hupp, at Wheeling, West Virginia, July, 1865. There was

a depressed cicatrix over the solution of continuity of the skull. The aperture in the parietal seemed to be about an inch in length, by three-fourths of an inch in breadth. The patient's speech was interrupted and stammering. There was defective sensation in the right hand, and numbness over a tract extending from the seat of the wound to the left side of the bone. Exercise of body or mind occasioned pain in the cicatrix and left temporal region. Any jolting, or stooping, effort in lifting, or any sudden or loud noise produced a sensation as of straining of the brain substance through the aperture. The patient described this sensation as very painful. In March, 1839, this pensioner resided at Bridgeport, Belmont county, Ohio, and the examining surgeon of the Pension Bureau reported that he was totally and permanently disabled, and required cautious and watchful care by night and day.

Buckley, John B., Corporal, Co. D, 62d Pennsylvania Volunteers, aged 24 years, received a bayonet wound of the forehead, through the right superciliary ridge, at Chancellorsville, Virginia, May 3d, 1863. It was found, on examination, that the weapon had penetrated the frontal sinus, and passed horizontally backwards into the brain. The patient was transferred to Washington, and was admitted to Finley Hospital on the 9th, in a perfectly conscious condition, with a natural pulse and freedom from febrile excitement. Acting Assistant Surgeon Lewis Heard passed a bougie along the track of the wound into the right anterior lobe of the brain the distance of four inches, without force, and without the least pain to the patient. The perforation in the skull barely admitted the point of the index finger. There were found a few small fragments of bone still hanging at the inner edge of the orifice. There was no hæmorrhage. Perfect quietness was strictly enjoined, a saline laxative was ordered, and cold water dressings were applied. The diet was light. On May 14th, he continued conscious and comparatively comfortable, complaining of but little pain in the head. Temporizing treatment was continued. For the next two days signs of mental disturbance were noticeable, and partial loss of vision, with optical illusions. He complained of headache, and a febrile movement arose, with intense thirst. The bowels were kept open by Epsom salts. Pus and disorganized brain tissue were discharged from the wound. At noon, on the 16th, he moved his arms about tremulously, catching at imaginary objects, arousing, occasionally, from the stupor into which he had fallen, complaining of increased pain in the head, and then talking incoherently. The skin was of natural temperature, and the pulse at 80. On May 17th, the patient had passed a quiet night. The pulse was at 125; there was greater tremulousness of the arms, with increased stupor, and vision was nearly extinct. The patient had great thirst, but no appetite. The discharge of pus and disorganized brain substance continued. Slight convulsions occurred in the afternoon, and the patient sank gradually, and died at six o'clock P. M., thirteen days after the reception of the injury. At the post mortem examination, made fourteen hours after death, the sinuses and the dura mater were found to be highly engorged with blood. The right hemisphere of the brain was sliced off, and over the right lateral ventricle a slight prominence was observed, which, on being punctured, gave exit to a quantity of pus. The wound penetrated through the anterior lobe of the brain under the right edge of the corpus callosum, opened the right lateral ventricle, and extended back to the posterior crus of the fornix, which seemed to have sustained injury. The two lateral and third ventricles were filled with pus, and pus was also found in the fourth ventricle, and beneath the cerebellum around the medulla oblongata. Acting Assistant Surgeon Lewis Heard reported the case.*

G———, Thomas, Private, Co. B, 90th Ohio Volunteers, was admitted, on November 27th, 1863, to Hospital No. 1, Nashville, Tennessee, with a bayonet wound behind the left parietal eminence, inflicted by a sentinel. For several days the patient was in a state of stupor, and was obstinately constipated. Both of these conditions were removed by the use of powerful purgative medicines. Meanwhile the cicatrization of the wound progressed rapidly, and on December 8th it had nearly closed. On this day the patient complained, for the first time, of severe headache. A probe, passed through the small orifice of the wound, indicated denuded and detached bone at its base. A T-shaped incision was made, and several fragments of dead bone were extracted. On the 11th, there was somnolence and cephalagia, and increased stupor, with slight intolerance of light and sound; the pulse was full and slow, forty-eight beats per minute. The scalp was tumid; the wound gaped, and was filled with fungous granulations. The incisions in the scalp were extended, and some of the loose bits of bone were removed. An ice bladder was applied to the head, and purgatives, with purgative enemata, were administered. On the 12th, the patient had some little appetite. The pulse was 44 and feeble. There had been no alvine evacuations, notwithstanding repeated doses of calomel and rhubarb, epsom salt, podophyllin, with terebinthinate enemata. In the forenoon, pills containing half a drop of croton oil were ordered to be given every hour until the bowels moved. On the 13th, the patient was freely purged. A fungus began to protrude from the wound. On the 14th, the headache was slight but constant, the skin cool, the pulse 42 and feeble. The cerebral hernia, tense and elastic, and indolent on pressure, still covered by the meninges, was steadily increasing in size. He was ordered half an ounce of wine every hour, with beef tea. On the 15th, the membranes covering the hernia sloughed, and the fungous appeared with a dark red granulated surface, not sensitive to the touch, nor bleeding readily. When the patient, in his restless sleep, rolled over upon the fungous growth, he would awake with a start. For the next two days he took wine in gradually augmented doses. His pulse became more feeble, and rose to 90 pulsations. Respirations 13, sighing. On December 19th, the whole fungous mass sloughed away. There was delirium and subsultus tendinum. The other symptoms were unchanged. Death took place on December 23d, 1863. At the autopsy, an abscess of the left hemisphere, and diffused arachnitis, were observed. The bayonet had penetrated an inch or more into the cerebrum. The calvaria was forwarded to the Army Medical Museum by Assistant Surgeon C. J. Kipp, U. S. Volunteers, with

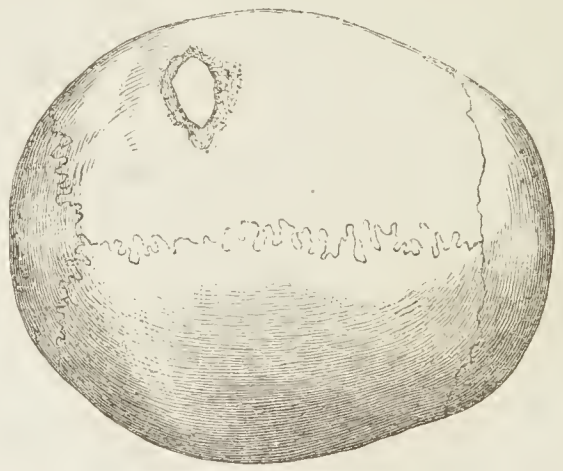


Fig. 9.—Perforation of the left parietal by a bayonet.—*Spec.* 2179, Surg. Sect. A. M. M.

* *American Medical Times*, June 10, 1863, Vol. VI, p. 292.

the foregoing notes of the case. It is represented in the adjacent wood-cut, (FIG. 8.) It shows a perforation of the left parietal behind the protuberance. The opening is egg-shaped; but the edges suggest its original triangular outline. The edges are rounded, and the texture of the bone near the solution of continuity is porous, particularly on the inner table. A slight fissure exists in the outer table.

H———, JOHN, Private of the Hospital Guards at the Lovell General Hospital, Portsmouth Grove, Rhode Island, aged 25 years, was confined four hours on the night of February 28th, 1863, as a punishment for bringing spirits into the camp and attempting to run the guard. When released from his cell by order of the officer of the guard, he rushed upon the latter and struck him in the face, whereupon the sergeant drew his sword, and, stepping back a pace, put himself in guard, holding the gripe of his sword firmly against the right hip, with the point slightly elevated. While in this position the prisoner again rushed upon the sergeant; but the ground being uneven, and the grass covered with a heavy frost, the assailant slipped and fell on the point of the sword, and then heavily forwards on the ground. When taken up he was insensible, and breathed heavily. On washing from his face the blood, which had flowed copiously from a slight wound in the right nostril, the officer of the day, an acting assistant surgeon, who was immediately summoned, detected no other injury than the trivial incision of the right ala of the nose. The man had been drinking freely, and, under the supposition that he was suffering only from the stupefying effects of liquor, increased by the fall upon his head, the surgeon remanded him to the guard-house, where he laid in a state of stupor until the following morning, when he was removed to one of the wards of the hospital. He was found to be still unconscious, and breathed stertorously, and moaned occasionally. The pulse was full and slow. The eyelids were closed, showing, when forcibly opened, the pupils dilated and immovable. The remedies usually employed in cases of apoplexy were directed, but consciousness could not be restored, and the patient died on the succeeding morning, March 2d, 1863, thirty-one hours after the reception of the injury. An autopsy was made nine and a half hours after death. *Rigor mortis* well pronounced. No external mark of violence was perceptible, except a wound five-eighths of an inch in length and one-eighth of an inch in depth on the external edge of the right nostril. The nostril was filled with coagulated blood. There was no sign of fracture of the nasal bones. On removing the calvarium, the blood vessels of the membranes of the brain were found to be engorged, and upon reflecting the membranes, the convolutions over the whole of the right hemisphere were found to be covered with extravasated blood. This extravasation extended along the whole of the base of the right side, and, to a slight degree, on the left, covering the whole surface of the cerebellum, increasing at the base and towards the medulla oblongata. The brain was then removed, and the posterior clinoid process of the sphenoid was found to be fractured transversely, and the middle and lower part of the superior turbinated bone was pierced. A small indentation, corresponding with the point of the sword, was found in the right clinoid process. The lungs were considerably engorged, but healthy and crepitant throughout. There was a slight adhesion found at the apex of the posterior part of the left lung. A portion of the sphenoid bone was removed to exhibit this very rare and interesting fracture. Unfortunately it was somewhat injured during maceration, but still gives a good illustration of this unusual form of injury. The portion of the sword which inflicted the injury was filed off, and was found to fill exactly the perforations of the ethmoid and sphenoid bones. The sword had penetrated about four inches from the nasal spine. The history of the case was carefully compiled by Acting Assistant Surgeon E. Seyffarth, and the specimen, represented in the accompanying wood-cut, (FIG. 10,) was forwarded by Surgeon L. A. Edwards, U. S. A., in charge of Lovell Hospital, to the Surgeon General.

FIG. 10.—Transverse fracture of the posterior clinoid process by a sword thrust.—*Spec.* 1612, Sect. I, A. M. M.

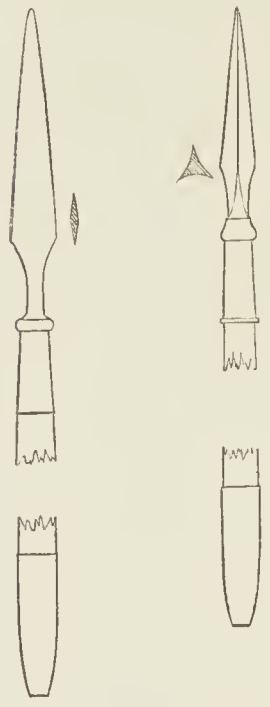
Saunder, G. W., Private, Co. D, 7th North Carolina Regiment, received at the battle of Gaines Mills, June 26th, 1862, a bayonet thrust in the forehead, which probably penetrated the frontal bone. He was conveyed to Richmond, and admitted, on June 27th, into Ward No. 3 of Chimborazo Hospital. He died on July 5th, 1862. Surgeon E. H. Smith, C. S. A., reports the case.

WOODBRIDGE, WILLIAM T., Musician, Co. F, 15th Indiana Volunteers, received on October 15th, 1863, a punctured wound of the skull from a bayonet thrust, which perforated the left parietal bone near its posterior superior angle. Two days after the injury he was received into the City Hospital at Indianapolis, Indiana, suffering with convulsions, and symptoms of meningitis and inflammation of the brain. On October 21st, several small fragments of bone were extracted; but the symptoms were not alleviated, and the patient died on October 27th, 1863, from abscess of the brain. Acting Assistant Surgeon J. M. Kitchen reports the case.

Of the six patients with punctured fractures of the cranium, one survived, though permanently disabled; and five died, with extravasation of blood in one case, cerebral hernia in one, encephalitis in one, and abscess of the brain in two cases.

The very intractable and fatal nature of such injuries is well known. The diagnosis is commonly difficult, the small dimensions of the external wound forbidding satisfactory exploration. If the external table only is punctured, it is true that there is not much more danger than in a wound of the soft parts; and recoveries take place when both tables are pierced, if there is no extravasation of blood, or wound of the membranes or the brain by the weapon, or by depressed splinters of the vitreous table. But when the puncture is small and

narrow, it is very difficult to determine its depth. The information obtained by the probe is unsatisfactory, and its use is not unattended by danger. When the brain is wounded, symptoms of cerebral mischief are frequently delayed until extravasation or the pent-up products of inflammation produce pressure. Thus the surgeon is restrained from interference until a period when interference is likely to be of little benefit.



1 2

FIG. 11.—1. Lance carried by the U. S. Lancers. 2. Lance carried by 6th Pennsylvania Cavalry. *Scale one-tenth to one inch.* From specimens furnished the A. M. M. by Capt. T. G. Benton, Ordnance Corps.

When arrows and lances were commonly used in warfare, this class of injuries were not uncommon, and many interesting examples of them are reported by authors.[1] The Indian hostilities in the western part of the United States still afford examples of punctures of the cranium by arrows.[2]

In the late war, the lance was not used to any extent, and no cases were reported of wounds of the head by this weapon. Two regiments were armed with it; but the nature of the country which was the theatre of war was regarded as ill adapted to the manœuvres of lancers; and, after serving for a while on escort duty, the regiments changed their equipment.

A very grave complication of punctures of the cranium consists in the breaking off of the penetrating weapon, which is sometimes so firmly wedged that its removal is a matter of great difficulty.

The treatment of punctures of the cranium will consist of the ordinary simple dressing of wounds of the scalp, until symptoms of cerebral disorder arise demanding mechanical interference. Recognizing the great probability of dangerous complications, the surgeon will insist on strict precautionary measures, and will incise the scalp, and expose the fracture, and remove spiculæ or foreign bodies, or elevate depressed bone as soon as he is satisfied that the brain or its membranes are injured.

Besides the six examples of puncture of the cranium by sharp-pointed weapons, reported on the preceding pages, the Army Medical Museum has specimens of punctures of the skull by arrows and tomahawks.[3] These preparations will be fully described in the next edition of the Museum Catalogue.

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[1] See Paré, *Œurres Complétes,* ed. Malgaigne, livre 8e); Morgagni, (*De Causis et Sedibus Morborum,* Vol. I); Briot, (*Histoire de l'Etat et des Progrès de la Chirurgie Militaire,* Besançon, 1817, p. 111); Percy, (*Manuel du Chirurgien d'Armée,* Paris, 1830, p. 101); Desport, (*Traité des Plaies d'Armes a Feu,* Paris, 1749, p. 374); Larrey, (*Relation Méd. de Camp. et Voyages,* Paris, 1841, p. 381; et *Clinique Chirurgicale, Paris,* 1829, T. I, pp. 156 et 192; et T. V, Paris, 1836, p. 323); Hennen, *Principles of Military Surgery,* London, 1829, p. 284); Rogers, *Transactions of the Royal Medico-Chirurgical Society,* Vol. XIII); South, (*Chelius's System of Surgery,* Am. ed., Vol. I, p. 437); Hewett, (*Dublin Med. Jour.,* 1851, p. 347); Legouest, (*Chirurgie d'Armée,* p. 277); Bonnefous, (*Jour. de Méd. de Montpellier,* 1860); Bruns, (*Die Chirurgischen Krankheiten,* Tübingen, 1854, S. 32, u. s. v.); Hyrtl, (*Handbuch,* S. 86); Velpeau, (*Dietionnaire de Médecine,* Paris, 1844, 2eme ed. T. XXIX, p 559); Fritze, (*Nassauische Jahrbücher,* Heft. VII, S. 64); Schneider, (*Die Kopferletzungen in Medicinish-gerichtlicher Hinsicht,* Stuttgart, 1848, S. 58.)

[2] For a very interesting account of arrow wounds, with numerous illustrative cases and judicious suggestions as to treatment, based on extensive observation of such injuries, the reader is referred to an article by Assistant Surgeon [now Surgeon and Bvt. Lieut. Colonel] J. H. Bill, U. S. Army, in the *American Journal of the Medical Sciences,* N. S., Vol. XLIV, p. 365.

[3] No. 5528, Section I, A. M. M., is the cranium of a Tonkaway warrior, with two punctures in the right parietal by the sharp point of a tomahawk. It was obtained near Fort Cobb, Washita River, I. T., by Dr. E. Palmer. No. 5531, is a cranium penetrated through the left antrum and orbit, by a stone-headed arrow. It was obtained from a grave in Alameda county, California, by Dr. C. Yates. No. 5644, is a segment of the anterior portion of the skull of a Mexican herder, with a perforation of the frontal, above the left superciliar ridge, by an iron arrow head, which had been driven deeply into the brain, in an Indian fight, seventy miles north of Fort Concho, in the summer of 1868. It was presented by Bvt. Major W. M. Notson, Assistant Surgeon, U. S. Army.

Section II.

MISCELLANEOUS INJURIES.

In this section such injuries of the head as are common to the soldier and the civilian will be considered. These comprise the results of railroad accidents, of falls, of blows from blunt weapons, of kicks from horses and mules, of the falling of trees or masonry, and other accidents.

It is impracticable to determine the total number of cases that should have been referred, during the war, to this category. On the monthly reports of sick and wounded, the contusions and lacerated wounds, and simple fractures, were entered numerically, without indication of the seat of injury. Cases of concussion and compression of the brain were returned separately, but these statistics were vitiated, because instances of gunshot wounds were oftentimes included. The information that can be gleaned from this source will be recorded at the end of this section. Abstracts of a few cases, cited from special reports, or from the histories of specimens in the Army Medical Museum, will illustrate the principal varieties of injuries of this class.

In movements of large bodies of troops by rail, the men crowded upon platforms and roofs of cars, contusions and lacerations of the scalp, concussions of the brain, and fractures of the skull, were not infrequent.

Railroad Accidents.—The following are examples of contusions from this cause:

Case.—Second Lieutenant John H. Masterson, Co. E, 100th U. S. C. T., aged 38 years, was thrown from a railroad car and received a severe contusion of the scalp, July 1st, 1864. He entered the Officers' Hospital at Nashville, Tennessee, the following day; recovered, under simple treatment, and was returned to duty July 25th, 1864.

Case.—Private John Jenkins, Co. G, 15th U. S. C. T., aged 28 years, fell from a railroad car at Nashville, Tennessee, December 26th, 1864, and received a severe contusion of the head. He was treated at Hospital No. 16, at Nashville, by cold applications, and was returned to duty, well, on January 4th, 1865.

Case.—Private Ganin McCoy, Co. C, 16th Veteran Reserve Corps, aged 57 years, received at Petersburg, Virginia, August 14th, 1863, a severe contusion of the forehead and right side of the head, by falling from a car in motion. He was admitted to York, Pennsylvania, Hospital, and discharged from service on January 8th, 1864, on account of persistent pain in the head.

Case.—Sergeant J. C. Williams, Co. B, 1st Wisconsin Heavy Artillery, aged 20 years, received in a railroad collision, on August 19th, 1864, a contused wound of the scalp. He recovered, under simple dressings, at the hospital at Lexington, Kentucky, and returned to duty August 22d, 1864.

Case.—Private L. J. Learned, Co. B, 1st Wisconsin Heavy Artillery, aged 22 years, was similarly injured at the same time and place, but with greater severity. He was transferred to Park Hospital, Milwaukie, Wisconsin, on September 18th, and was discharged from service December 26th, 1864.

Case.—Private S. Croyton, Co. G, 6th Virginia Cavalry, aged 17 years, received near Carlisle, Illinois, June 21st, 1865 several severe contused wounds of the scalp, in a railroad accident. He was treated with cold local applications at the Marine Hospital, St. Louis, Missouri, and recovered, and was discharged from service July 19th, 1865.

The following men also received, in railroad accidents, contusions of the head, of a slight nature, probably, as all were speedily returned to duty:

CASES.—Private J. Burns, K, 71st New York Volunteers, near Wilmington, Delaware, September 21st, 1864.
Captain D. Cornelius, C, 212th Pennsylvania Volunteers, near Baltimore, September 17th, 1864.
Private Peter Daly, G, 140th New York Volunteers, near York, Pennsylvania, January 7th, 1865.
Private L. P. Daniels, I, 2d Ohio Artillery, near Knoxville, January 29th, 1865.
Private W. Fogarty, A, 21st New York Cavalry, near Grafton, West Virginia, July 22d, 1864.
Private J. H. Fritton, A, 33d Illinois Volunteers, New Orleans, March 2d, 1865.
Private J. Jaide, E, 1st Missouri Militia, near St. Louis, April 29th, 1864.
Private D. Jones, A, 145th Ohio Volunteers, near Washington, May 21st, 1864.
Private W. Kennan, E, 14th Veteran Reserve Corps, near Baltimore, March 24th, 1864.
J. T. Langston, Military Train, near Summit Point, Maryland, November 16th, 1864.
Private J. N. Moore, C, 100th Pennsylvania Volunteers, near Pittsburg, March 23d, 1864.
Private A. Russell, I, 2d Ohio Heavy Artillery, near Knoxville, January 29th, 1865.
Corporal S. Shipman, F, 88th Illinois Volunteers, near Jeffersonville, Indiana, December 16th, 1864.
J. Slacher, Unassigned Recruit, near Elmira, New York, April 26th, 1865.
Sergeant F. Wright, B, 16th New York Cavalry, near York, Pennsylvania, January 7th, 1865.
Corporal C. Zuraff, A, 33d Illinois Volunteers, near New Orleans, Louisiana, March 3d, 1865.

In the following cases of contusions of the head, the injuries were of a severe character, probably, since the patients were discharged from service for disability:

CASES.—Private G. A. Campbell, I, 2d Ohio Art'y, near Knoxville, Tenn., January 29th, 1865. Discharged May 12th, 1865.
Private J. Carney, C, 43d New York Volunteers, near Albany, N. Y., March 7th, 1865. Discharged July 6th, 1865.
Private P. Coyne, A, 1st N. Jersey Artillery, near Washington, D. C., June 13th, 1865. Discharged July 10th, 1865.
Private T. Little, F, 122d Ohio Volunteers, near Washington, December 3d, 1864. Discharged January 23d, 1865.

Lacerations of the scalp were produced in the following cases:

CASE.—Private Philip A. Adams, Co. G, 8th Indiana Cavalry, aged 39 years, received June 30th, 1864, near Chattanooga, Tennessee, a severe lacerated wound of the scalp, by falling from a railroad car. He was admitted to Hospital No. 3, Nashville, Tennessee, on June 30th, and on January 11th, 1865, he was transferred to Gallatin, Tennessee. He was discharged the service for disability on June 5th, 1865.

CASE.—Private Clifford Allen, Co. I, 2d Ohio Heavy Artillery, aged 16 years, received a contused and lacerated wound of the left temporal region on January 29th, 1865, near Knoxville, Tennessee, from a railroad accident. He was admitted to the Asylum Hospital, at Knoxville, and recovered, under simple treatment, and was returned to duty on February 16th, 1865.

CASE.—Private Richard Bogles, Co. G, 20th Pennsylvania Cavalry, aged 21 years, received on April 11th, 1864, a severe lacerated wound of the right side of the scalp, by falling from a railway car, and was admitted to Grafton Hospital, West Virginia, on the same day. The wound did well under cold water dressings, and he was returned to duty on June 2d, 1864.

CASE.—Private Robert Boyd, Co. F, 8th New Jersey Volunteers, fell from a railway car near Wilmington, Delaware, on June 21st, 1864, and received a lacerated wound of the scalp. He was immediately conveyed to the Tilton Hospital. Simple dressings were applied, and he was returned to duty July 8th, 1864.

CASE.—Private Albert Edgar, Co. G, 20th Pennsylvania Cavalry, aged 18 years, was wounded on the same occasion, and the preceding history applies to his case.

CASE.—Private L. J. Frence, Co. I, 2d Ohio Heavy Artillery, aged 21 years, received a severe contusion, with a lacerated wound of the scalp, on the same occasion as the preceding, and returned to duty at the same date.

CASE.—Private John B. Glynn, Co. 11, 24th Missouri Volunteers, received a severe scalp wound by a fall from a railway car, on March 1st, 1863. He was admitted to Lawson Hospital, St. Louis, Missouri, and returned to duty June 1st, 1863.

CASE.—Private G. W. Haines, Co. I, 2d Ohio Heavy Artillery, aged 36 years, was wounded in the same accident, and was treated in the same hospital. He had a wound of the scalp, with a very severe contusion, and recovered slowly. He was discharged from service on May 21st, 1865. Surgeon F. Meacham, U. S. V., reports the case.

CASE.—Private G. W. Marvin, Co. I, 2d Ohio Heavy Artillery, aged 20 years, was wounded at the same time and place, receiving a laceration of the scalp, extending from behind the left ear to the occipital protuberance. He recovered, under simple treatment, and was discharged from service May 24th, 1865. Surgeon F. Meacham reports the case.

The following were returned to duty after receiving, in railroad accidents, slight lacerations of the scalp:

CASES.—Private G. W. Francis, C, 112th Pennsylvania Volunteers, near Philadelphia, November 7th, 1864.
Private G. Gormer, K, 2d Maryland P. H. V. B., near Cumberland, Maryland, October 20th, 1864.
Private W. Gunnin, 2d Massachusetts Volunteers, near Albany, New York, June 8th, 1864.
Sergeant J. H. Jackson, G, 149th Indiana Volunteers, near Indianapolis, Indiana, August 25th, 1865.
Sergeant A. Mitchell, 27th Michigan Volunteers, near Cincinnati, Ohio, April 13th, 1863.
Private L. H. Palmer, K, 97th Illinois Volunteers, Algiers, Louisiana, November 1st, 1863.
Private T. W. Peverley, A, 33d Illinois Volunteers, near New Orleans, Louisiana, March 2d, 1865.
Private T. Powers, H, 97th Illinois Volunteers, near Algiers, Louisiana, November 1st, 1863.
Private D. Swinger, A, 19th Veteran Reserve Corps, near Baltimore, September 3d, 1864.
Private J. Williams, L, 193d New York Volunteers, near Baltimore, May 18th, 1865.

The following were discharged from service on account of lacerations of the scalp of a graver description:

CASES.—Private J. Fallon, A, 1st New Jersey L. Artillery, near Washington, June 13th, 1865. Discharged July 10th, 1865.
Private R. S. Harper, A, 1st Virginia Artillery, near Columbus, Ohio, February, 1865. Discharged May 29th, 1865.
Private A. Kimball, G, 10th Vermont Volunteers, near Brattleboro, Vt., June, 1865. Discharged July 14th, 1865.
Private M. Rice, G, 86th New York Volunteers, at Bristol, Pa., March 7th, 1865. Discharged June 7th, 1865.

In four of these forty-nine cases of contusions and lacerations of the scalp, erysipelatous inflammation supervened, and others were complicated by sloughing and burrowing of pus. The patients all ultimately recovered.

In the following cases, concussion of the brain was the most important feature:

CASE.—Captain W. W. Cushing, Co. I, 125th Ohio Volunteers, aged 27 years, was admitted to the Officers' Hospital, Nashville, Tennessee, on March 12th, 1865, laboring under concussion of the brain, resulting from a railroad accident on March 1st. He was furloughed on March 13th, 1865, and did not report subsequently.

CASE.—Private A. Faigue, Co. B, 153d New York Volunteers, received, in a railroad accident, near Harper's Ferry, Virginia, April 20th, 1865, a severe contusion of the head, accompanied by concussion, and probably laceration, of the brain. He was admitted on the same day to the Island Hospital, at Harper's Ferry, and survived but a few hours. Acting Staff Surgeon N. F. Graham reports the case.

CASE.—Joseph M. Grace, unassigned recruit, aged 16 years, jumped from the cars while in motion, near Bowling Green, Kentucky, on November 4th, 1864. He was admitted to Hospital No. 3, at Nashville, Tennessee, on November 5th. There was a severe contusion on the head, and signs of grave concussion of the brain. He recovered from the head symptoms, but died on April 5th, 1865, from some pulmonary complication. Surgeon J. R. Ludlow, U. S. V., reports the case.

CASE.—Patrick King, aged 23 years, a laborer in the employ of the subsistence department, fell from a railroad car July 22d, 1863, and was admitted to the General Hospital at Frederick, Maryland, on the following day, in a semi-comatose condition, in consequence of a severe contusion of the forehead, with concussion of the brain. As the stupor passed off, there was mild delirium; but the patient gradually improved under the use of saline cathartics and a low diet, and was returned to duty, August 14th, 1863.

CASE.—Corporal T. J. Smith, Co. G, 6th Virginia Cavalry, aged 20 years, was wounded, on the night of June 21st, 1865, by a collision of trains on the Ohio and Mississippi Railroad, near Carlisle, Illinois. The regimental surgeon, Dr. A. H. Thayer, reports that there were very grave symptoms of concussion of the brain. The patient was conveyed to the Marine Hospital, St. Louis, where Assistant Surgeon E. M. Horton, U. S. A., reports that arteriotomy was performed without any beneficial result. The patient died on June 23d, 1865.

CASE.—Private John Taft, Unassigned Recruit, received, in an accident on the Philadelphia and Baltimore Railroad, March 30th, 1865, near Wilmington, Delaware, a severe contusion of the head, with concussion, and probably laceration, of the brain. He was conveyed to Tilton Hospital, at Wilmington. Every effort to bring about reaction was unavailing, and the case terminated fatally on the following day, March 31st, 1865. No autopsy was held. The case is reported by Surgeon E. J. Bailey, U. S. Army.

CASE.—Sergeant T. Wise, Co. K, 134th Ohio Volunteers, aged 35 years, received, in a railroad accident, June 6th, 1864, near Point of Rocks, Virginia, a severe concussion of the brain. He was admitted to Judiciary Square Hospital, and after reaction had taken place, he was treated by purgatives, rest, and low diet. He recovered, and was furloughed for forty days, and failed to return, but joined his regiment "of three months men," on October 20th, 1864, to be mustered out. Assistant Surgeon Alexander Ingram, U. S. A., reported the the case.

In the following cases, without injury to the walls of the cranium, there appears to have been some obscure injury to its contents:

CASE.—Private James Buckland, Co. H, 2d Missouri Artillery, received, in a railroad accident near St. Louis, August 13th, 1864, a severe contusion of the head. He was received into Schofield Barracks Hospital on the same day, with symptoms of severe concussion of the brain. His condition was relieved in a short time, but, after a few days, paralysis of the motor nerves of the lower extremities was observed, and symptoms indicative of softening of the brain ensued. The case terminated fatally, September 14th, 1864, from ramollissement. Assistant Surgeon E. M. Powers, U. S. V., reports the case.

CASE.—Lieutenant William Harrington, 29th Pennsylvania Volunteers, aged 28 years, fell from a railway car in motion, near Chester, Pennsylvania, March 1st, 1864. He was admitted to the Citizens' Volunteer Hospital, in Philadelphia, on the following day. There were signs of severe concussion of the brain; but no evidence of fracture could be detected. He died on March 4th, 1864. The relatives refused to permit an autopsy. Surgeon R. S. Kenderdine, U. S. V., reports the case.

CASE.—Private Edward McKeeby, Co. C, 19th Illinois Volunteers, aged 30 years, on June 12th, 1864, while riding on a railroad car, received a contusion of the right side of the occiput, by striking violently against a bridge. He was admitted, on June 13th, into Hospital No. 8, Nashville, Tennessee, at which time there were no external marks of violence, and no pain. Occasional delirium was the only indication of mischief to the contents of the cranium. On the third day the symptoms were greatly aggravated. Coma supervened, with involuntary discharges; and death took place on June 25th, 1864. At the autopsy, there was found upon the superior surface of the right cerebral hemisphere, and beneath the pia mater, a small collection of pus, and upon the left side a coagulum of blood. The inferior surface of the cerebellum, medulla oblongata, pons varolii, and optic commissure, were covered with a thick coat of pus. The right lateral ventricle and choroid plexus were likewise covered with pus. A clot of blood was found interposed between the dura mater and cranium, below the right lobe of the cerebellum. There was a contusion, with extravasation of blood, beneath the scalp on the right side of the occiput. No fracture could be detected. The thoracic and abdominal organs were normal in appearance. Surgeon R. R. Taylor, U. S. V., reports the case.

CASE.—Sergeant S. Warner, Co. C, 34th New Jersey Volunteers, aged 31 years, near Beverley, New Jersey, July 15th, 1864, fell from a railway car in motion, and received a very severe contusion of the head. He was taken to the Beverley Hospital, and presented the symptoms of severe concussion, but, in addition, the pupils were quite irresponsive to light, and vision was extinct. The symptoms of compression were speedily relieved, but vision did not return. On April 4th, 1865, the patient was transferred to Satterlee Hospital, Philadelphia, and was discharged from service May 24th, 1865, for traumatic amaurosis, completely, and probably permanently, blind. Assistant Surgeon Dallas Bache, U. S. A., reports the case.

The following cases of railway accidents were attended by fractures of the skull:

CASE.—Sergeant Charles Dougherty, Co. C, 69th Pennsylvania Volunteers, aged 38 years, while in an intoxicated condition, fell from a railroad car, on April 16th, 1864, receiving a severe contusion of the left temporal region, and a compound fracture of the right humerus. He was admitted to Cuyler Hospital, Germantown, Pennsylvania, on April 18th. The arm was dressed in an angular splint, and stimulants were administered. There was much ecchymosis about the temple and orbit. The general symptoms approached those of delirium tremens. There was apparent improvement for the first twenty-four hours, when obstinate vomiting began, and recurred with brief intermissions. On the morning of the fifth day, the patient was in a moribund condition, pulseless at the wrist, bathed in a cold perspiration, and delirious. There was a general capillary congestion amounting to cyanosis almost, and an excessive dilatation of both pupils, with insensibility to light. Coma gradually came on, and death on April 20th, 1864. The autopsy revealed extensive congestion of the membranes and substances of the brain, softening and laceration of the spleen, with extravasation of blood in the abdominal cavity, congestion of the base of the right lung, and a multiple fracture of the right humerus. Assistant Surgeon H. S. Schell, U. S. A., reports the case.

CASE.—Walter Fitch, in the employ of the Quartermaster Department, aged 19 years, received a fracture of the vault of the cranium, by being thrown from a railroad car in motion, May 18th, 1864. He was admitted to the field hospital at Bridgeport, Alabama, on May 19th, with symptoms of compression of the brain. Death took place on May 26th, 1864. Assistant Surgeon H. T. Legler, U. S. V., reports the case.

CASE.—Private Edwin French, Co. F, 3d Delaware Volunteers, aged 18 years, was thrown from a railway car, on June 21st, 1862, and the fall produced a linear fracture of the skull near the vertex. He was admitted to hospital at Frederick, Maryland, August 22d, 1862. The treatment was expectant. He was transferred to Race Street Hospital, Philadelphia, on September 27th. The case is entered on the register as one of "general debility." He was transferred on January 14th, 1863, to Mower Hospital, Philadelphia, and complained of great dizziness and pain in the head. On February 15th, he had a severe chill, due apparently to malarious influences, since quinine prevented the recurrence of other paroxysms. In May he was well enough to perform duty as a nurse in the ward. He was transferred to the Veteran Reserve Corps on August 27th, and was sent to modified duty on September 3d, 1863.

CASE.—Private George H———, Co. I, 3d Delaware Volunteers, fell from a railroad car, on June 22d, 1862, his head striking the ground with great violence. He was taken up in a stunned and insensible condition, and was conveyed to the neighboring post hospital at Winchester, Virginia. Acting Assistant Surgeon W. Draine found a severe contusion over the right parietal eminence, and, as grave symptoms of compression of the brain were apparent, he made a free crucial incision through the scalp, with the expectation of finding a depressed fracture of the skull. But, although the skull was freely exposed by reflecting the flaps of integument, no evidence of fracture was observed. The patient lingered, comatose, for a few days, and died on June 26th, 1862. At the autopsy, a fissure seven inches in length was discovered, commencing in the squamous portion of the right temporal bone, passing through the right parietal protuberance, crossing the sagittal suture at right angles, and running forward on the left parietal bone. The specimen (FIG. 12) was forwarded by Dr. Draine to the Army Medical Museum, and the facts above recorded were reported by Surgeon George Suckley, U. S. V.

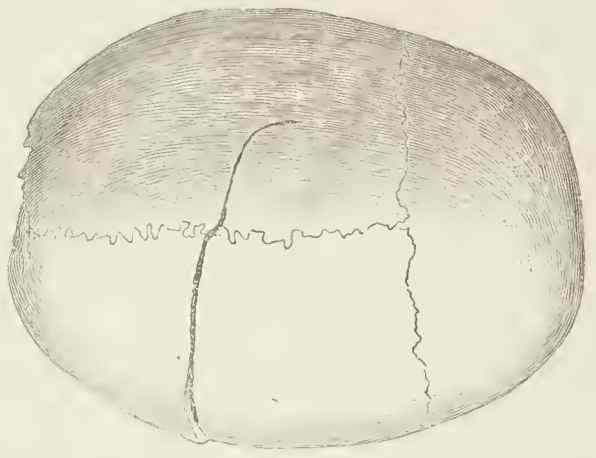

FIG. 12.—Fissure of the vault of the cranium from a fall from a rail-car in motion.—*Spec.* 130, Sect. I, A. M. M.

CASE.—Private A. Mitchell, Co. E, 6th Indiana Cavalry, aged 28 years, received, in a railway accident, near Murfreesboro, Tennessee, on October 30th, 1864, a severe lacerated wound of the head, with fracture of the right parietal bone. He also had a compound fracture of the right fore-arm. He was conveyed to Nashville, and subsequently was transferred to Jefferson Barracks, St. Louis, on December 6th, 1864. There had not been, at any time, signs of compression, and, on his arrival at St. Louis, the cerebral symptoms had disappeared. After undergoing an amputation at the arm, he recovered, and was discharged from service, well, on April 5th, 1865.

CASE.—Private G. Spancell, Co. A, 105th Illinois Volunteers, in a railroad accident near Murfreesboro, Tennessee, September 10th, 1863, received a compound fracture of the skull. He was placed in hospital under the care of Surgeon W. Threlkeld, U. S. V. The case was complicated by laceration of the brain, and extravasation of blood within the cranium, and death took place within a few hours after the accident, September 10th, 1863.

CASE.—Private Zachariah Ward, Co. H, 139th Indiana Volunteers, aged 17 years, fell from the cars in motion, near Mumfordsville, Kentucky, July 4th, 1864. He was taken to the military hospital at Mumfordsville, where a simple linear fracture of the frontal bone was diagnosticated. There were no symptoms of compression, and the treatment was of the expectant nature. On August 14th, he was transferred to Clay Hospital, at Louisville, Kentucky, and again, on September 10th, to the City Hospital, at Indianapolis, Indiana. With the exception of slight vertigo and headache, he had quite recovered at this date, and two weeks subsequently, September 24th, 1864, he was returned to duty with his regiment.

CASE.—Private Matthew Young, Co. I, 1st Ohio Artillery, aged 39 years, received a compound fracture of the left parietal bone, with a terrible laceration of the scrotum, on November 29th, 1864, in a railroad accident, near Knoxville, Tennessee. He was taken to the Asylum Hospital, at Knoxville. It was found that the symptoms did not justify operative interference. The testes had been quite torn away, and the constitutional depression was great. The patient lingered in great suffering until December 16th, when he died. The case is reported by Surgeon B. Barnum, 25th Michigan Volunteers.

The next case appears to furnish an example of fracture of the base of the cranium by *contre-coup:*

CASE.—Private Joseph Weber, Co. C, 6th New York Cavalry, fell, or jumped, from a railroad car in motion, near Newark, New Jersey, on January 11th, 1865. He was carried to the Centre Street Branch of the Ward Hospital, at Newark. It was found that there was a compound comminuted fracture of the frontal bone. He was sensible, and conversed with readiness, and walked up stairs to his bed. Meningitis soon supervened, indicated by nausea, rigors, contracted pupils, with intolerance of light, and severe headache. These symptoms were unavailingly combatted by cold applications to the head, purgatives and revulsives. The case terminated fatally on January 15th, 1865. At the autopsy, it was found, on removing the scalp, that the frontal bone was badly fractured, being comminuted near the right frontal eminence, while fissures, penetrating both tables, extended backwards, nearly to the coronal suture, and downwards, quite into the right orbit. On removing the calvarium, a large clot was found on the dura mater, below the right frontal eminence. The membranes were much congested, and were covered in places with fibrinous exudations, and elsewhere were strongly adherent to the calvarium. The cerebrum, and particularly the right hemisphere, was found in the same highly congested state. The removal of the encephalon disclosed a second simple fracture, of the base of the cranium, extending through the basilar process of the occipital bone, nearly to the foramen magnum. The case is reported by the late Assistant Surgeon J. T. Calhoun, U. S. A., the report of the *post-mortem* examination being furnished by Acting Assistant Surgeon W. S. Ward.

FALLS.—Injuries of the head by falls were not uncommon, especially in the cavalry. The following are examples of contusions or lacerations of the scalp from this cause:

CASES.—The men named in this category, by being thrown from their horses, or falling from heights, received injuries of the scalp of sufficient severity to be admitted into General Hospitals, whence they were returned to duty, after intervals of from two to one hundred and thirty-six days:

Private F. Albrecht, Co. F, 7th Michigan Cavalry, Alexandria, Virginia, October 20th, 1863.
Private B. F. Alsop, 3d Iowa Cavalry, near Vicksburg, Mississippi, March 10th, 1864.
Private F. Andrews, A, 12th Ohio Cavalry, Lexington, Kentucky, April 15th, 1864.
Private R. F. Barton, L, 1st Kentucky Cavalry, near Knoxville, Tennessee, July 6th, 1864.
Private F. Beal, 1st Provisional Cavalry, Washington, D. C., December 11th, 1865.
Corporal J. Blethune, 37th Co., 2d Battalion Veteran Reserve Corps, near Washington, D. C., January 31st, 1865.
Private S. S. Burridge, E, 9th New York Volunteers, Alexandria, Virginia, September 28th, 1863.
Private F. Campbell, H, 6th United States Infantry, Hilton Head, South Carolina, November 1st, 1865.
Private A. B. Chamberlain, H, 4th Vermont Volunteers, Philadelphia, Pennsylvania, March 13th, 1863.
Private P. Crow, C, 1st Missouri Artillery, Rolla, Missouri, May 21st, 1863.
Private J. Dailey, E, 30th Massachusetts Volunteers, New Orleans, Louisiana, September 19th, 1863.
Private H. Egbert, D, 7th Illinois Volunteers, Fayetteville, North Carolina, March 14th, 1865.
Private M Fesby, F, 29th U. S. C. T., Point of Rocks, Virginia, March 31st, 1865.
Private J. Haley, 18th Massachusetts Volunteers, near Boston, Massachusetts, December 11th, 1864.
Sergeant T. Haley, 1st Delaware Volunteers, Gettysburg, Pennsylvania, July 3d, 1863.
Private J. A. Hern, E, 12th New York Volunteers, near Alexandria, Virginia, December 20th, 1862.
Lieutenant D. Hillis, I, 3d New York Artillery, Newberne, North Carolina, May 22d, 1864.
Private T. Marin, I, 3d New Jersey Battery, near Fort Monroe, Virginia, August 1st, 1864.
First Lieutenant J. D. McBride, H, 44th Missouri Volunteers, Nashville, Tennessee, December 1st, 1864.

Private, S. McCarty, B, 10th New Jersey Volunteers, near Philadelphia, Pennsylvania, January 7th, 1864.
Private P. McDougal, 61st Massachusetts Volunteers, near Galloup's Island, Massachusetts, January, 1865.
Private J. McFarland, K, 2d New Jersey Cavalry, Memphis, Tennessee, December 28th, 1864.
Private G. L. McKenzie, A, 10th New York Cavalry, York, Pennsylvania, July 6th, 1863.
Private G. Meyers, G, 41st Missouri Cavalry, St. Louis, Missouri, June 30th, 1865.
Private F. Munch, B, 11th Indiana Volunteers, Columbia, Tennessee, January 14th, 1865.
Private P. O'Donald, F, 15th New York Cavalry, near Alexandria, Virginia, June 30th, 1865.
Private P. Palmer, I, 1st Veteran Reserve Corps, Washington, D. C., February 13th, 1864.
Private W. Pomperi, F, 71st New York Volunteers, Shipboard, February 2d, 1864.
Private J. Regan, C, 50th Pennsylvania Volunteers, Harrisburg, Pennsylvania, April 11th, 1864.
Private M. Rigel, B, 20th Pennsylvania Cavalry, Martinsburg, Virginia, June 2d, 1864.
Private B. L. Roberts, K, 39th Kentucky Volunteers, Lexington, Kentucky, June 12th, 1864.
Private S. Smith, C, 1st Iowa Cavalry, Memphis, Tennessee, March 26th, 1865.
Private J. Steves, E, 91st New York Volunteers, Baltimore, Maryland, February 23d, 1865.
Private E. Sullivan, M, 11th Kentucky Cavalry, Lexington, Kentucky, November 18th, 1864.
Private F. Tarbox, H, 14th Pennsylvania Cavalry, Harper's Ferry, Virginia, April 20th, 1865.
R. Taylor, Government employé, near Harper's Ferry, Virginia, June 10th, 1865.
Private J. E. Thomas, G, 115th Pennsylvania Volunteers, near Philadelphia, Pennsylvania, June 1st, 1863.
Private L. Turrier, H, 29th Illinois Volunteers, near Mobile, Alabama, March 27th, 1865.
Private T. Trempeman, E, 16th Illinois Cavalry, Camp Butler, Illinois, July 29th, 1863.
Private P. Vincentio, B, Native California Cavalry, San Francisco, California, January 20th, 1864.
Private J. N. Wise, B, 1st Pennsylvania Artillery, Washington, D. C., May 4th, 1864.
Private E. York, G, 3d Ohio Volunteers, Columbia, Tennessee, January 14th, 1865.
Private J. Yorkman, B, 23d Michigan Volunteers, Columbia, Tennessee, November 26th, 1864.

The following are examples of severer contusions of the head, resulting from falls. Many of them terminated in such disabilities as to disqualify the patients from further active service:

Case.—Private W. Alentharpe, Co. M, 9th Indiana Cavalry, was thrown from his horse at Vicksburg, Mississippi, May 18th, 1865, and fell upon his head. He was admitted to McPherson Hospital, and was found to have a severe lacerated wound of the right parietal region, with grave symptoms of concussion of the brain. He partially recovered, and was discharged from service June 15th, 1865. Assistant Surgeon J. A. White, U. S. V., reports the case.

Case.—Private A. Alteman, Co. G, 1st Pennsylvania Artillery, aged 40 years, fell from his horse July 1st, 1864, striking his head on the left temporal region. He received a severe concussion of the brain. He was admitted to hospital at Chambersburg, Pennsylvania, and was returned to duty on September 2d, 1864; but instead of rejoining his regiment, he proceeded to the York Hospital, where he remained until January 18th, 1865, when he was transferred to the military hospital at Pittsburg. Here he remained until June 5th, 1865, when he was transferred to Chester, Pennsylvania, whence he was discharged from service for disability July 26th, 1865. The disability appears to have been due to chronic rheumatism, rather than the effects of the injury. Surgeon T. H. Bache, U. S. V., reports the case.

Case.—Private J. C. Baumbach, Co. E, 65th Ohio, was admitted to hospital at Camp Chase, Ohio, December 23d, 1864. He had been thrown from his horse, and, falling upon the left side of his head, had suffered a severe concussion of the brain. There was entire loss of vision of the left eye, and the vision of the right eye was impaired. After a time deafness of the right ear supervened. The patient was discharged from service May 17th, 1864, for disability. The case is reported by Surgeon S. S. Schultz, U. S. V.

Case.—Private Frank Clune, 15th New York Cavalry, was thrown from his horse at Louisville, Kentucky, July 26th, 1865, and fell violently upon his head. He was admitted to Crittenden Hospital immediately after the accident, and died in a few hours, July 20th, 1865, from the effects of concussion and probable laceration of the brain. No fracture or extravasation of blood was detected. It was impossible to bring about reaction from the condition of extreme depression resulting from the concussion. Assistant Surgeon J. C. G. Happersett, U. S. A., reports the case.

Case.—Private Dexter Cole, Co. I, 25th Michigan Volunteers, in October, 1862, received a severe blow upon the head by a fall, and was admitted into Stanton Hospital at Washington, on February 1st, 1863, completely deaf, in consequence of the commotion or concussion of the brain. Every method of treatment for the restoration of his hearing having been employed unavailingly, he was discharged from service February 26th, 1863, on the certificate of Surgeon John A. Lidell, of his total disability.

Case.—Private J. D. Davis, Co. F, 10th Indiana Volunteers, aged 42 years, was admitted to Cumberland Hospital, Nashville, Tennessee, December 6th, 1864, on account of a fall from a horse on the previous day. He had a bad contusion of the scalp and concussion of the brain. He recovered, and was sent to Jeffersonville Hospital on January 7th, 1865. He was treated for chronic rheumatism till February 22d, when he was transferred to Hospital No. 15, at Nashville, where he was treated for asthma until May 24th, 1865, when he was finally discharged from service. The case is reported by Surgeon W. M. Chambers, U. S. V.

Case.—Private Henry Drimeyer, Co. C, 28th Ohio Volunteers, aged 28 years, a somnambulist, fell from a second story window while walking in his sleep, in July, 1863, and, striking on his head, received a severe contusion and concussion of the

brain. He was admitted to the Marine Hospital, Cincinnati, Ohio. He recovered from the immediate effects of the accident, but his idiosyncrasy was regarded as such a dangerous one for a soldier, that he was discharged from service August 16th, 1863. Acting Assistant Surgeon John Davis reports the case.

CASE.—Sergeant D. H. Gleason, Co. H, 1st Massachusetts Cavalry, aged 28 years, was thrown from his horse in a charge at Gettysburg, July 1st, 1863, and received a very severe concussion of the brain. He was sent to the hospital at the Cavalry Depot at Camp Stoneman, Washington. After recovering from the symptoms of concussion, he suffered from persistent pain in the head, and on March 7th, 1864, he was sent to Finley Hospital, Washington. He recovered, and returned to duty October 1st, 1864. The case is reported by the late Surgeon G. L. Pancoast, U. S. V.

CASE.—Private P. Goodman, Co. C, 13th New York Cavalry, aged 46 years, received a severe injury of the head, by being thrown from his horse, February 13th, 1864. He was admitted to Campbell Hospital, and was discharged from service, with complete loss of vision in his right eye, March 6th, 1864. Surgeon A. F. Sheldon, U. S. V., reports the case.

CASE.—Corporal J. B. Hefler, Co. D, 7th Pennsylvania Cavalry, aged 25 years, was thrown from his horse, at Louisville, Kentucky, April 15th, 1864, falling between his own horse and that of a comrade, and striking upon his head. His injury was supposed to be of a slight character; but he suffered from constant headache until the 29th of August, when an abscess commenced to form over the right parietal. The abscess was opened on November 30th. The patient was then transferred to the hospital at Madison, Indiana. On his admission, his pulse was ninety, his skin dry, his tongue coated, and bowels constipated. On examining the seat of injury the parietal bone was found to be denuded, and externally necrosed for a space one and a half inches in width, by two and a half inches in length. On December 21st, the scalp was freely divided and the flaps reflected, with a view of removing the necrosed bone; but upon examination the necrosed portion did not seem to be sufficiently separated to justify operative interference. On January 1st, 1865, very marked symptoms of compression were ushered in suddenly, convulsions recurring in rapid succession for two days, when a comatose condition supervened, which lasted until the patient's death, on January 13th, 1865. At the autopsy, a large abscess was found in the right hemisphere of the cerebrum communicating with the lateral ventricle, and containing several ounces of pus. There were evidences of inflammation of the cerebellum and meninges of the brain. The necrosed portion of bone was, in two or three places, perforated. It was observed that the walls of the cranium were very thin. The thoracic and abdominal viscera were normal in appearance. The notes of the case were furnished by Acting Assistant Surgeon H. F. Bosworth.

CASE.—Lieutenant J. Hendrick, Co. H, 6th Pennsylvania Cavalry, was thrown from his horse in August, 1863, and his head struck the ground with such violence as to produce a severe concussion of the brain. He was admitted to the Officers' Hospital at Philadelphia, with partial hemiplegia of the right side, and occasional attacks of delirium. With rest and restricted diet, these symptoms gradually disappeared, and this officer was returned to duty, well, on February 5th, 1864. Acting Assistant Surgeon W. Camac reports the case.

CASE.—Private C. S. Miller, Co. I, 18th Connecticut Volunteers, aged 30 years, fell from a bridge at Harper's Ferry, Virginia, October 27th, 1864, and received a severe contusion of the scalp with concussion of the brain. He was sent to the hospital at Sandy Hook, Maryland, on the following day, and was transferred to Frederick, on November 2d. He gradually recovered his physical health, but dullness of intellect persisted, and he was discharged from service for disability, on May 21st, 1865. Assistant Surgeon T. H. Helsby, U. S. A., reported the case.

CASE.—Private John Miller, Co. E, 4th Pennsylvania Cavalry, aged 31 years, fell from a tree, on June 16th, 1863, and struck upon the left side of his head, and upon his shoulder, fracturing the left clavicle. He was admitted, a few hours afterwards, to Lincoln Hospital, Washington, in a semi-conscious condition, partially insensible, the surface pale and cold, with other symptoms of severe concussion of the brain. Stimulants were administered. He failed to react. On the following day his respiration became more labored, and, failing gradually, he died on June 18th, 1863. Surgeon G. S. Palmer, U. S. V., reports the case.

CASE.—Private J. P. Schneider, Co. L, 1st Missouri Engineers, aged 30 years, was thrown from a wagon, near New Madrid, in November, 1863, and, striking on his forehead, was badly stunned, and received a contused and lacerated wound of the integuments. He was treated in several hospitals, at Chattanooga, Cumberland, and Jeffersonville, and is reported as suffering from indigestion, hernia, neuralgia, and other ailments, and finally, at Mound City Hospital, Illinois, on December 1st, 1864, with ulceration of the frontal bone, over the sinuses. He was discharged the service on account of incurable disease of the frontal sinuses and turbinated bones, on March 11th, 1865. Surgeon H. Wardner, U. S. V., reports the case.

CASE.—Private Charles Sherman, Co. A, Todd's Scouts, was thrown from his horse, on August 18th, 1863, and, striking upon the right side of his head, received a severe concussion of the brain. He was admitted to Camp Dennison Hospital, Ohio, a few hours after the reception of the injury, at which time respiration was almost extinct, pulse soft and feeble, and extremities cold. Complete insensibility existed, although he could swallow stimulants in small quantities. Sinapisms were applied to the back of the neck and to the extremities, and reaction was slowly established. On August 19th, he remained unconscious, with irregular and labored respiration, pulse 60, full, slow, and incompressible, with involuntary discharge of urine, and partial paralysis of the right arm. During the evening of the same day symptoms of improvement and returning consciousness were manifest. At 9 p. m. the pulse was 110, and full. He was bled, and the pulse increased in frequency, but afterwards fell to 112. Upon the application of cold to the head the respiration became natural. On August 20th, he opened his eyes when sharply spoken to, his respiration was natural, pulse 78, and compressible. He continued in this condition until August 26th, when his symptoms improved still more, and he replied to questions readily. He had no paralysis, and took liquid nourishment freely. He recovered completely, and was returned to duty on October 22d, 1863. Surgeon B. Cloak, U. S. V., reported the case.

CASE.—Private F. Tillotson, Co. B, 7th Kansas Cavalry, aged 25 years, received a severe concussion of the brain by a fall from his horse, near Memphis, Tennessee, and was transferred from a hospital at that city to the Marine Hospital at St. Louis, on September 16th, 1864. He was furloughed on November 20th, and on December 24th, 1864, he deserted. Surgeon A. Hammer, U. S. V., reports the case.

CASE.—Private T. J. Wittermode, Co. I, 14th Indiana Volunteers, was admitted to Mower Hospital, Philadelphia, March 16th, 1863, with a very severe contusion of the scalp, occasioned by a fall. A puffy tumor of the scalp, which subsided under the use of evaporating lotions, while persistent pain at the seat of injury continued. The patient was transferred to McDougal Hospital, New York, on April 22d, thence to Fort Wood, thence to New York City, where he was transferred to the Veteran Reserve Corps, on July 27th, 1863, in accordance with G. O. No. 235, War Department, A. G. O., 1863.

The next series consists of abstracts of thirteen cases of simple or compound fractures of the cranium produced by falls:

CASE.—Private John W. Anderson, Co. E, 19th Michigan Volunteers, fell down stairs in the court-house at McMinnsville, Tennessee, February 2d, 1864, and, striking his head, produced a fracture of both tables of the left temporal bone. He was admitted to hospital under the charge of Surgeon John Bennett, 19th Michigan Volunteers, who records the accident upon his regimental monthly report. The case terminated fatally on February 6th, 1864. At the autopsy, intense congestion of the cerebral vessels was observed, with effusion of serum in the cavity of the ventricles; but no extravasation of blood was observed.

CASE.—Private J. J. Brooks, Co. G, 9th Illinois Cavalry, aged 28 years, was thrown from his horse on April 5th, 1864, and fell upon his head. A fracture, involving the frontal, temporal, sphenoid, ethmoid, and upper maxillary bones, was produced. The patient was taken to the Adams Hospital at Memphis, Tennessee. He died a few hours after his admission, and it was found that the brain had been extensively contused and lacerated. Acting Assistant Surgeon F. Impey reports the case.

CASE.—Private James Carr, Co. G, 6th United States Cavalry, aged 24 years, fell from his horse on July 6th, 1863, receiving a wound of the frontal region with fracture, and depression of the inner table of the skull. He was admitted to Carver Hospital, Washington, on July 24th, in an irritable, morose, and restless condition. Three days subsequently he was slightly delirious, and respiration was difficult. In the afternoon he became completely unconscious, with insensible pupils and stertorous breathing, and death ensued in a few hours, on July 27th, 1863. The autopsy revealed a depression of the inner table of the frontal bone, and an abscess immediately beneath, filled with sanious pus, and surrounded with plastic lymph. Many of the sulci were adherent, and patches of lymph were distributed on the anterior and middle lobes of the brain. Surgeon O. A. Judson, U. S. V., reports the case.

CASE.—Private William Day, Co. C, 57th Illinois Volunteers, aged 44 years, an epileptic subject, a deserter from his regiment, had a severe fall, April 1st, 1864, and was admitted, in a delirious state, to the Marine Hospital at Chicago, Illinois. Acting Assistant Surgeon R. M. Isham, who reports the case, does not describe the symptoms, or the appearances at the autopsy; but states that there was a fracture of the base of the cranium, and that compression of the brain, consequent upon a large extravasation of blood within the skull, was the cause of death. The patient died April 3d, 1864.

CASE.—Private Hugh Donelly, Co. K, 38th New York Volunteers, received at the battle of Williamsburg, May 5th, 1862, a flesh wound of the shoulder. He was made a prisoner. While confined at Richmond he had a fall in prison, striking his head, and producing a depressed fracture of the right parietal bone. He was exchanged, and received into hospital at Camp Parole, Annapolis, on February 5th, 1863. He was deaf, and his mental faculties were very sluggish and obtuse. He was discharged from service for total disability on February 18th, 1863. Surgeon James Norval, 79th N. Y. S. M., reports the case.

CASE.—Sergeant Albert K———, Co. A, 4th Pennsylvania Cavalry, falling violently upon his head, in April, 1862, in Washington, D. C., had a fracture of the left side of the occipital bone, attended with laceration of the brain. He entered the Judiciary Square Hospital in an insensible condition, with stertorous breathing, dilated pupils, slow pulse, and relaxed sphincters. Cold applications to the head, purgatives, and derivatives, were employed unavailingly. The patient passed into a condition of profound coma, and died April 28th, 1862, from compression of the brain. Acting Assistant Surgeon C. G. Page made the autopsy, and found a partially organized coagulum in the substance of the posterior lobe of the left hemisphere, and in the cavity of the left ventricle. The clot is not recent, and the brain substance in the vicinity is firmly contracted around it. It is of a dark brownish-yellow color, and spongy in texture, and measures one inch in diameter by one-fourth of an inch in thickness. On the surface of the brain there is a more recent clot, black in color, and partially disorganized, measuring nearly the same as the first. The specimen was contributed by Dr. Page to the Army Medical Museum. A view of the clot in the ventricle is given in the accompanying wood-cut, (FIG. 13.)

FIG. 13.—Portion of left hemisphere of the brain containing a coagulum.—*Spec.* 505, Sect. I, A. M. M.

CASE.—Sergeant J. J. Kent, Co. L, 1st Wisconsin Cavalry, aged 29 years, was thrown from his horse February 18th, 1864, and falling on his head, had a depressed fracture of the left parietal bone near its coronal suture. It can only be learned of the early history of the case that it was treated on the expectant plan. The patient was admitted to Harvey Hospital, at Madison, Wisconsin, on July 27th. He made a very good recovery, returning to duty October 10th, 1864.

CASE.—Sergeant Alexander N———, Co. B, 13th New York Cavalry, was thrown from his horse while riding in the streets of Washington, on August 10th, 1865, his head striking violently upon the pavement. He was taken to the hospital at

Camp Barry in an insensible condition, and, in a few hours, became delirious. He remained so until his death, which took place on August 14th, 1865. There was no external evidence of depression or fracture of the skull, but simply a severe contusion o the forehead. The autopsy revealed a three-branched linear fracture of the frontal bone. Its direction is indicated in the accompanying wood cut. (FIG. 14.) Externally one line of fracture passes from the centre of the superior border of the bone downward and outward through the right frontal eminence. From the upper third of this fissure a second fissure passes nearly at right angles downward through the left frontal eminence. This last fissure involves the external table only. The inner table is fissured to correspond with the first line of fracture, and there is also a short fissure branching upward. The inner table opposite each frontal eminence is reticulated, and in the centre of the perforated plate on the left side there is a small nodule of bone of the size of a grain of wheat. The specimen, with a memorandum of the case, was forwarded to the Army Medical Museum by Surgeon J. M. Homiston, 3d New York Provisional Cavalry.

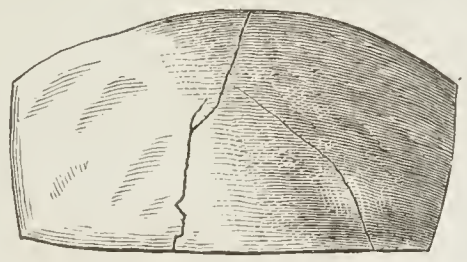

FIG. 14.—Fracture of the frontal bone without displacement, from a fall from a horse.—*Spec.* 297), Sect. I, A. M. M.

CASE.—Lieutenant J. M. Ragan, Co. E, 1st Tennessee Artillery, aged 30 years, was thrown from his horse, June 18th, 1865, and was admitted into the Officers' Hospital, at Knoxville, Tennessee, on the following day, laboring under very grave symptoms of compression of the brain. He died, June 25th, 1865, from extravasation of blood, consequent upon the fracture of the skull. Surgeon F. Meacham, U. S. V., reports the case.

CASE.—Private E. G. Stevens, Co. D, 8th Vermont Volunteers, aged 18 years, fell from a second story window, in New Orleans, on June 10th, 1864, his head striking the ground. He was conveyed to the University Hospital, and Surgeon Samuel Kneeland, U. S. V., recognized the usual signs of fracture of the base of the cranium. There was also a contused and lacerated wound of the vertex. The case terminated fatally June 11th, 1864.

CASE.—Private C. Timberman, Co. C, 2d New Jersey Cavalry, aged 19 years, received, April 22d, 1864, a severe fall. He was admitted to Gayoso Hospital, at Memphis, Tennessee, on April 30th, and was found to have a compound fracture of the occipital bone. There were no symptoms which were thought to justify operative interference, and the treatment consisted of cold applications to the head, and purgatives. Death took place on May 11th, 1864. Surgeon F. N. Burke, U. S. V., reports the case.

The two following were believed to be examples of fracture by *contre-coup*:

CASE.—Private John H. Bowker, Co. A, 3d Maine Volunteers, was thrown from a horse, March 26th, 1862, at Fort Monroe, Virginia and, falling upon his head, received a fracture of the base of the skull. He was immediately conveyed to the Hygeia Hospital, with marked symptoms of compression of the brain. He died, March 27th, 1862. Brigade Surgeon R. B. Bontecou, U. S. V., reported the case.

CASE.—Private Peter Flynn, Co. H, 2d Ohio Heavy Artillery, was admitted to the Post Hospital at Munfordsville, Kentucky, January 3d, 1864, with a fracture of the skull. He had every symptom of grave compression of the brain, and blood was passing from his mouth and ears. He was comatose, and died two hours after his admission. The man had received a heavy blow upon the left supra-orbital ridge, whether by a weapon, or fall, could not be ascertained; but no evidence of fracture could be discovered at this point. Surgeon S. Albright, 2d Ohio Heavy Artillery, who reports the case, believed that there must be a fracture of the base of the skull by *contre-coup*. The *post mortem* examination proved the correctness of this diagnosis. There was a fissure running across the petrous bone, diastasis of the sutures between the occipital and left temporal, with a large coagulum of blood in the left cranial fossa.

BLOWS.—Contusions and lacerations of the scalp, concussion of the brain, and fractures of the cranium, were produced by a great variety of blows. When received in action, such injuries were commonly inflicted by clubbed muskets, falling trees or branches cut down by artillery, or by kicks from horses or mules. In affrays in camp or on the street, similar injuries were more generally produced by blows from clubs or axes, slung shot, and various other blunt weapons, or by bricks or stones:

CASES.—The nineteen following named patients were admitted to hospital for contusions or lacerations of the scalp by blows from muskets, and were returned to duty, the average duration of treatment being about one month:

Private J. W. Anderson, H, 19th Massachusetts Volunteers, in action, at Gettysburg, July 2d, 1863.
Private D. W. Butler, A, 92d Illinois Volunteers, at Nashville, Tennessee, November, 1864. Deserted.
Private C. Chamberlain, A, 34th New Jersey Volunteers, November, 1863.
Private H. W. Jones, K, 9th New Hampshire Volunteers, in action, near Jackson, Mississippi, July 14th, 1863.
Private R. Launtz, C, 54th Pennsylvania Volunteers, in action, at Piedmont. Virginia, June 5th, 1864.
Private P. Leonard, G, 2d Michigan Cavalry, in action, near Nashville, Tennessee, December 7th, 1864.
Private J. Linebacker, F, 13th Missouri Volunteers, accidentally, at Rolla, Missouri, December 11th, 1864.
Private M. J. Loud, A, 2d Rhode Island Volunteers, in action, near Appomattox, Virginia, April 6th, 1865.
Private J. McCracken, A, 5th Tennessee, accidentally, Cincinnati, Ohio, January 22d, 1865.
Private H. McLaughlin, G, 16th New York Cavalry, near Alexandria, Virginia, July 31st, 1864.
Private W. Magee, L, 2d Iowa Cavalry, in action, near Nashville, Tennessee, December 18th, 1864.

Private Conrad Osman, Co. I, 108th Ohio Volunteers, Marietta, Georgia, November 13th, 1864.
Private W. A. Palmer, A, 146th New York Volunteers, in action, near Spottsylvania, Virginia, May 5th, 1864.
Corporal T. Robb, A, 2d District of Columbia Volunteers, Washington, D. C., August, 1865.
Corporal J. Schinkel, D, 28th Ohio Volunteers, near Beverly, West Virginia, February 7th, 1864.
Private J. Snowdon, F, 30th United States Colored Troops, in action, near Petersburg, Virginia, July 30th, 1864.
Private J. Sweeney, G, Second Battalion, 14th United States Infantry, near Annapolis, Maryland, June 9th, 1863.
Private W. J. True, K, 2d Illinois Volunteers, near Memphis, Tennessee, March 10th, 1865.
Private A. Wolf, D, 59th New York Volunteers, in action, at Gettysburg, July 2d, 1863. Deserted.

CASES.—The twelve following received injuries of the head, of a more severe nature, from blows from muskets:

Private Andrew Berry, Co. B, 14th Pennsylvania Cavalry, aged 54 years, at Snicker's Gap, Virginia, April 1st, 1865, in action. Was sent to Satterlee Hospital, Philadelphia; thence to McClellan Hospital, July 16th; thence to Mower Hospital, July 20th, and was discharged from service August 24th, 1865, in accordance with G. O., War Department, A. G. O., May 3d, 1865.

Private M. Brown, B, 140th New York Volunteers, in action, at Spottsylvania, May 12th, 1864.

Private *W. B. Burns*, A, 22d North Carolina Regiment, was admitted to Farmville Hospital, Virginia, August, 1864, and was discharged from the Confederate service for total deafness, resulting from a blow received, in action, from a musket.

Private J. Hewett, Co. B, 2d Vermont Volunteers, aged 28 years, received, May 5th, 1864, a lacerated wound of the scalp, with concussion of the brain, by being struck with the butt of a musket at the battle of the Wilderness. He was treated at the University Hospital, Baltimore, and at the Smith Hospital at Brattleboro, Vermont, and returned to duty July 29th, 1864.

Private M. Leisure, 173d Ohio Volunteers, aged 30 years, accidentally, at Nashville, Tennessee. Transferred July 1st, 1865. Not accounted for.

Private Otis J. Libby, Co. H, 16th Maine Volunteers, was struck on the head by a musket, at the battle of Fredericksburg, December 12th, 1862, and was sent to Alexandria, December 19th, and was discharged from service, totally disabled, on March 30th, 1863. The case was recorded by Surgeon E. Bentley, U. S. V.

Private J. Logan, Co. C, 6th Maine Volunteers, aged 28 years, received a lacerated wound of the scalp, July 21st, 1861, at the first battle of Bull Run. He was treated at the Mason Hospital, Boston, and returned to duty, and was subsequently discharged from service on account of epileptic fits, January 11th, 1865.

Private J. O'Donnell, Co. K, 12th Maine Volunteers. Insubordination, December 9th, 1862. In 1863 and 1864, he was serving out his sentence by Court Martial, at Ship Island, Mississippi, and Tortugas, Florida.

Private J. Parker, Co. K, 2d New Hampshire Volunteers, aged 23 years, March 12th, 1864. Partial paralysis of left arm. Recovery, and returned to duty, May 6th, 1864.

Private Sampson Turner, Co. F, 66th Ohio Volunteers, was admitted into the Twentieth Army Corps Hospital, on July 6th, 1864, much debilitated by malarious attacks. While in hospital, a musket fell upon his head, producing a concussion of the brain, and almost instant death, on August 26th, 1864.

Private W. Walter, 3d Pennsylvania Reserve Volunteers, June 26th, 1864, lacerated wound of the scalp, at the battle of Gaines' Mills, 1862. Examined for 44th Regiment V. R. C., January, 1867.

Private Robert M. Young, Co. D, 107th Illinois Volunteers. Laceration of the scalp by a blow from the butt of a gun. Admitted to Douglas Hospital, Washington, July 17th, 1863. He was transferred to the Invalid Corps, September 16th, 1863.

The seven following abstracts refer to examples of fracture of the skull resulting from blows from muskets:

CASE.—Private Michael B———, Co. F, 9th Massachusetts Volunteers, while sleeping on the ground after the battle of Gettysburg, Pennsylvania, July 4th, 1863, was struck on the head by a musket in the hands of a fellow soldier. The hammer of the musket inflicted a wound of the left temple and a depressed fracture at the middle of the lower border of the left parietal and adjoining portion of the left temporal bone. The patient was conveyed to Baltimore. He was admitted, on July 5th, into Jarvis Hospital, in a comatose condition There was a hernia of the brain of the size of a walnut. The patient retained voluntary motion of the lower limbs. The pupils were irregular and insensible to the light. Consciousness was never restored, and death took place on July 6th, 1863, forty-four hours after the reception of the injury. At the autopsy, made fourteen hours after death, the left side of the calvarium was removed, and a number of long fragments were found imbedded in the middle lobe of the left hemisphere, the brain tissue being broken up as far as the left lateral ventricle. Two fragments, one of the outer and one of the inner table remained attached; the latter and one of the former having their free edges depressed one-fourth of an inch. The oval opening made in the skull is represented in the adjacent wood-cut, (FIG. 15.) The pathological specimen and notes of the case were contributed by Surgeon D. C. Peters, U. S. Army.

FIG. 15.—Section of cranium fractured by a blow from a musket.—*Spec.* 1457, Sect. I, A. M. M.

CASE.—Private James H. Burns, Co. F, 9th New Hampshire Volunteers, was struck, at Petersburg, Virginia, July 30th, 1864, with the butt of a musket, and received a contused wound of the scalp, with fracture and depression of the right parietal bone, two and a half inches anterior to the lambdoidal, and two inches external to the sagittal suture. On June 1st, 1865, he was transferred to the 6th New Hampshire Volunteers. Cephalalgia, upon exposure to the sun, was the only troublesome symptom. He was mustered out of service on July 17th, 1865.

CASE.—Private Wm. McIntire, Co. K, 2d Delaware Volunteers, received a blow from the butt of a pistol in a street brawl, at Wilmington, Delaware, November 21st, 1863. He was conveyed to Tilton Hospital, where Surgeon E. J. Bailey, U. S. Army, who reports the case, found that there was a compound fracture with depression of the left parietal, causing grave injury to the brain. Operative interference was deemed inexpedient, and the patient died, November 25th, 1863.

CASE.—Private Jarvis Nunn, Co. A, 12th Kentucky Volunteers, aged 18 years, was admitted into the Old Hallowell branch of the military general hospitals at Alexandria, Virginia, February 1st, 1865, with a compound fracture of the skull by a blow from the muzzle of a musket in the hands of a comrade. The wound and fracture were situated a little above and to the outside of the left frontal eminence. There was no disturbance of the mental faculties, and no especial derangement of the physical functions at the date of the patient's admission, except slight constipation, which was overcome by a cathartic. On February 4th, a slight febrile movement, with a dull frontal headache and swelling of the left parotid gland was observed; but there was no obtuseness of intellect. On the following day, the left side of the face was œdematous. The eyes, particularly the left eye, being watery. The bowels were soluble. The wound had now commenced to suppurate, the discharge being fœtid. Cold applications were made to the head. On the 7th, the pupils were dilated, and the tongue was protruded with difficulty. On February 8th, the patient was delirious, deaf, unable to articulate, or to protrude his tongue. He could be roused with difficulty from his comatose state. The respiration was at 44, and the pulse thready at 115. It was necessary to evacuate the urine by a catheter. On the 9th, the coma became profound; respiration 36; pulse 128; pupils widely dilated, and irresponsive to light. On February 10th, the respiration was very labored, the face and neck œdematous; the eyelids firmly closed; but, when forcibly separated, revealing the pupils dilated to almost the extent of the iris. The urine and fæces were discharged involuntarily. The surface was covered by a profuse sweat. The radial pulse was imperceptible. Death took place at three o'clock in the afternoon of February 10th, 1865. At the autopsy there was found, on the left side of the sinciput, a wound covered with yellow pus, and beneath, a depressed fracture of the frontal bone; and on removing the skull-cap a dark coagulum. The dura mater was not inflamed, but was separated from the bone for some distance around the fracture. The anomaly of the right lung being divided into two lobes only was noticed. This lung was emphysematous, and the bronchial mucous membrane on this side was thickened and discolored. The tissue of the left lung was crepitant, but red and slightly softened. The structure of the spleen was softened. The case was reported by Surgeon E. Bentley, U. S. V.

CASE.—Private Joseph Richards, Co. G, 13th Wisconsin Volunteers, aged 52 years, received, at Paint Rock, Alabama, December 31st, 1864, a lacerated wound of the scalp, with fracture of the right parietal, by a blow from a musket. He was sent to the hospital at Huntsville, where he recovered from the symptoms of concussion at first manifested, and was so far convalescent that, on March 31st, 1865, he was transferred to Nashville, Tennessee. On April 13th, he was sent to Crittenden Hospital, at Louisville, Kentucky, and thence to Swift Hospital, at Prairie du Chien, Wisconsin. He recovered from his injury, and was discharged from service, on June 30th, 1865.

CASE.—Private David Smith, Co. K, 113th Ohio Volunteers, aged 23 years, was struck on the head by a musket, August 4th, 1864, in a private quarrel, and received a partial fracture of the frontal and left parietal bones. He was received into Adams Hospital, at Memphis, Tennessee, August 17th, 1864. He recovered perfectly, under expectant treatment, and was returned to duty December 10th, 1864. Surgeon J. G. Keenon, U. S. V., reports the case.

CASE.—Private E. J. Tripp, Co. B, 77th New York Volunteers, aged 42 years, in the battle of Spottsylvania, May 10th, 1864, was struck upon the head with the butt of a musket which produced a severe contusion of the scalp, and a simple fracture of the cranium. These injuries seem to have led to no very serious derangement of the cerebral functions since the patient was able to return to duty in October, and to go into action at the battle of Cedar Creek, October 19th, 1864, when he received a flesh wound in his groin, for which he was treated in the field hospital of the Second Division of the Sixth Corps, and afterwards at Martinsburg, Virginia, whence he was furloughed, on February 1st, 1865, to report at Ira Harris Hospital, Albany, New York, on March 12th. He was discharged from service August 7th, 1865, on account of loss of power in the lower extremities, and impairment of the mental faculties, resulting from the injury of the head. Assistant Surgeon James H. Armsby, U. S. V., rated his disability at two-thirds.

The following men received injuries of the head from falling trees or branches:

CASES.—The seventeen men named in this series had contusions or lacerations from the above cause of sufficient severity to require treatment in general hospitals. They were all returned to duty after a few days or weeks of treatment, with the exception of a few who were mustered out of service, or who deserted:

Private W. R. Bradstreet, Co. B, 19th Maine Volunteers, in action, Wilderness, Virginia, May 9th, 1864.
Drummer D. Cain, Co. H, 20th Massachusetts Volunteers, Brandy Station, Virginia, May 2d, 1864.
Corporal G. Chase, Co. H, 4th Vermont Volunteers, March 23d, 1865.
Private J. Cozzens, 14th Co. Unattached Massachusetts Volunteers, June 22d, 1864.
Private F. Freeman, Co. I, 25th Wisconsin Volunteers, October 10th, 1864.
Lieutenant D. B. Greeley, Co. B, 11th Iowa Volunteers, in action, at Corinth, Mississippi, October 4th, 1862.
Private T. Lee, Co. H, 20th Indiana Volunteers, January 13th, 1865.
Private J. McIntyre, Co. B, 157th New York Volunteers, Fillifinny, South Carolina, December 6th, 1864.
Private J. McNulty, Co. D, 26th Massachusetts Volunteers, August 23d, 1864.
Private J. Maine, Co. K, 162d New York Volunteers, Winchester, Virginia, February 22d, 1865.
Private J. D. Mansfield, Co. B, 16th Maine Volunteers, February 7th, 1865.
Private J. Miles, Co. C, 16th Illinois Volunteers, February, 1865.
Private G. H. Miller, Co. B, 23d United States Colored Troops, Petersburg, Virginia, October, 27th, 1864.

Private E. B. Mitchell, Co. K, 15th Virginia Volunteers, Cumberland, Maryland, August 9th, 1864.
Private T. Mount, Co. D, 77th Illinois Volunteers, March 27th, 1865.
Private J. Naylor, Co. D, 52d Illinois Volunteers, Rome, Georgia, November 1st, 1864.
Private J. Talbot, Co. I, 189th New York Volunteers, June 1st, 1865.

CASES.—The fourteen named in this series were dischargedfrom service on account of disabilities, produced by more severe injuries, from the same cause:

Private Edward Harris, Co. H, 120th New York Volunteers, in action, at Hatcher's Run, Virginia, February 8th, 1865.
Private Peter Hollahan, Co. G, 73d New York Volunteers, January 4th, 1865.
Private John W. Hudson, Co. A, 60th Ohio Volunteers, June, 1865.
Private John Larkin, Co. D, 88th New York Volunteers, April, 1865.
Private William Loveland, Co. F, 21st New York Cavalry, March 23d, 1865.
Corporal Arthur McCune, Co. D, 7th Indiana Volunteers, January, 1865.
Private Patrick Maloney, Co. D, 46th New York Volunteers, Petersburg, Virginia, November 3d, 1864.
Private Otto Nestler, Co. B, 7th New York Volunteers, February 5th, 1865.
Private Joseph W. Newland, Co. G, 80th, New York Volunteers, Rochester, New York, November 13th, 1864.
Private D. Rogers, 29th United States Colored Troops, Petersburg, Virginia, October 25th, 1864.
Private Christian Smith, Co. E, 7th New York Volunteers, April, 1865.
Private Patrick Sullivan, Co. H, 73d New York Volunteers, May, 1865.
Private Stephen Twelves, Co. A, 116th Pennsylvania Volunteers, Chancellorsville, Virginia, May 3d, 1863.

CASE.—Lieutenant John A. Porter, Co. C, 36th Illinois Volunteers, aged 23 years, in the engagement at Resaca, Georgia, May 15th, 1864, was struck on the head by a limb of a tree which had been cut off by a solid shot He fell, senseless, the blood gushing from his mouth and nostrils. He remained in an unconscious state for forty-eight hours, when he was conveyed to the hospital at Chattanooga, Tennessee. On admission, he was speechless, and completely paralyzed in the upper extremities and in the muscles of the head and face. On June 18th, he was transferred to Hospital No. 1, at Nashville, whence he was furloughed on August 1st, 1864. At this date "the entire upper part of his body was paralyzed." He remained at his home until November 10th, when, having regained his strength, and, in a measure, the use of his upper extremities, he returned to the hospital, and thence to duty with his regiment at Pulaski, Tennessee. He participated in the engagements at Spring Hill and Franklin, Tennessee, on November 29th and 30th, hoping that the excitement would restore his voice. He stated that the sound of musketry and artillery firing "almost burst his head." In the early part of December, 1864, after violent and repeated efforts to utter a sound, a copious hæmorrhage took place from the fauces, and possibly the upper portion of the larynx, preceded by a feeling of "cracking and bursting," and a sense of "rushing upward in the head." The hæmorrhage was followed by complete return of his voice, seven and one-half months after the reception of the injury. During this period tinnitus aurium and vertigo existed, at times, to such extent as to deprive him of sight and hearing. He was mustered out of service on October 8th, 1865, with his regiment. On June 13th, 1866, he was pensioned, to date from October, 1865. The examining surgeon reporting a concussion of the right hemisphere of the brain, which caused "general debility, affecting the right leg, arm, and eye" He drew his pension at the Quincy Agency, Illinois, March 4th, 1869, and was then reported as permanently disabled. He resided at Little York, Warren county, Illinois, and wrote thence, in the spring of 1866, a very detailed account of his accident, from which the above abstract is partially compiled. He stated that he suffered so much from dizziness, from flow of blood to the head, that he supposed he would never recover his health, and concluded: "I am unable, entirely, for manual labor; yet my wound was received in a glorious cause, and one that I was willing to sacrifice my life for."

In the next two cases, falling trees produced fractures of the cranium:

CASE.—Private James M. Logan, Co. K, 106th Illinois Volunteers, was, in January, 1863, struck by a falling tree, which fractured the cranium at the vertex, just posterior to the coronal suture, involving both tables. He was admitted to the hospital at the provisional encampment at Fort Pickering, Tennessee, where he remained under treatment until August 4th, 1863, when he was discharged from the service. On August 8th, 1863, Pension Examining Surgeon Thomas B. Henning, examined the case, and reports that a portion of the bone was lost, and that the pulsations of the brain were visible. An abscess had formed in the left temporal region, and was then discharging. The man was debilitated, and when exposed to the sun, or exertion, would suffer from vertigo and headache.

CASE.—Private John Tyler, Co. K, 30th United States Colored Troops, was injured, on December 27th, 1864, by a falling tree, which produced a linear fracture of the cranium, extending from the sagittal suture obliquely through the left parietal and temporal bones to the middle foramen lacerum. He was admitted to the field hospital of the Twenty-fifth Army Corps on the same day, in an unconscious condition, from which he never rallied. His pulse was slow and weak, respiration stertorous, and pupils insensible to light. But little nourishment could be given in consequence of impaired deglutition. With the exception of slight improvement in his pulse, he continued in the above condition until his death, on December 31st, 1864. At the autopsy, effusion of blood in the left parietal and temporal regions beneath the scalp, and slight effusion internally upon the dura mater. Beneath the dura mater, on the right side, a thin coagulum extended from the upper surface of the hemisphere, down into the middle fossa of the cranium, where it was one-fourth of an inch in thickness. The convolutions of brain were flattened from pressure. The inferior portion of the right middle lobe, for a space of one and a half inches, was much ecchymosed and softened, and blended with the coagula. There were two ounces of serum in the sub-arachnoid space, and in the lateral ventricles, which were somewhat distended. The left hemisphere was normal; no other organs were examined. Surgeon Norton Folsom, 45th United States Colored Troops, reports the case.

Kicks, from horses and mules, were a not infrequent cause of injuries of the head:

CASES.—The ten named in the following list were received into hospital on account of contusions or lacerations of the scalp by kicks from horses or mules, and were returned to duty after a brief interval:

Private William Brown, Co. G, 21st New York Cavalry, November 1st, 1864.
Teamster R. Broyden, Quartermaster's Department, January 13th, 1865.
Private Alonzo Cole, Co. G, 6th Pennsylvania Reserves, June 30th, 1863.
Private William Deal, Co, I, 7th Illinois Cavalry, July 28th, 1864.
Sergeant R. S. Dow, Co. C, 39th Massachusetts Volunteers, October 15th, 1864.
Bugler Jacob Horn, Co. K, 5th United States Artillery, Buzzard Roost, Georgia, May 9th, 1864.
Private Joshua Lewis, Co. A, 5th Michigan Volunteers, July, 1863. Deserted, September 3d, 1863.
Private Andrew Peters, Co. G. 3d United States Colored Troops, St. Louis, December 4th, 1862.
Private Edward T. Simmons, Co. G, 1st Delaware Volunteers, May, 1864.
Private Calvin Starzman, Co. H, 12th Illinois Cavalry, February 21st, 1865.

CASES.—The four following are reported as discharged from service on account of severe injuries of the head, without fracture, from kicks:

Private John W. Forckers, Co. A, 3d Maryland Volunteers, March, 1865.
Private Andrew Kerr, Co. G, 1st Michigan Cavalry, November 25th, 1863.
Private Philip Seton, Co. G, 169th New York Volunteers, July 25th, 1865.

CASES.—The four following are reported as having received simple fractures of the skull from kicks; but the accidents were not followed by any very grave symptoms, since the men were returned to duty, or discharged, as well:

Private William N. Elwood, Co. I, 29th Pennsylvania Volunteers. Returned to duty, June 22d, 1865.
Private Peter Leiser, Co. C, 67th Ohio Volunteers. Discharged, October 1st, 1863.
Private George Styles, Co. B, 20th New York Cavalry. Returned to duty, July 12th, 1865.
Private John L. Weigel, Co. I, 8th Ohio Cavalry. Returned to duty, October 29th, 1864.

CASE.—Private George A. Teasdale, Co. G, 36th New York Volunteers, received a severe contused wound of the scalp, with fracture of the left parietal bone, by a blow from a horse's foot, in a cavalry charge, at the first battle of Bull Run, July 21st, 1861. He was made a prisoner, and remained in confinement until the termination of the war, in the spring of 1865. He was then released, and was examined at Washington for admission into the 44th Regiment Veteran Reserve Corps. He was suffering from very imperfect vision, resulting from the injury he had received. The late Assistant Surgeon W. A. Bradley, U. S. Army, reported the case.

CASE.—Abraham, a colored teamster of the Quartermaster's train of the 20th Army Corps, received, September 14th, 1863, near Stevenson, Alabama, a kick from a mule. The blow was found to have produced a depressed fracture of the left temporal bone. Surgeon D. J. McKibben, U. S. V., who records the case, states that the patient died on September 17th, 1863 from compression of the brain.

These cases comprise all the injuries of the head from kicks that have been reported by name, with the exception of one, which will be cited among the cases of trephining, at the conclusion of this section.

Injuries of the head, requiring treatment in hospitals, were frequently produced in private quarrels, or affrays, by blows from clubs and other blunt weapons:

CASES.—The forty-one named in the following list received contusions or lacerations of the scalp from blows from clubs, &c., and were returned to duty after a short period of treatment in general hospital:

Private Samuel Biland, Co. L, 1st Missouri Artillery, November 26th, 1863.
Private Abraham Bowen, Co. I, 16th Kentucky Volunteers, June 4th, 1864.
Private B. F. Boswell, Co. D, 1st District of Columbia Volunteers, October 2d, 1864. Deserted.
Sergeant Wm. Campbell, Co. E, 33d Iowa Volunteers, March 31st, 1865.
Private F. E. Conn, Co. F, 1st United States Artillery, January 5th, 1865.
Private *S. F. Conway*, Co. D, 1st Virginia Cavalry, December 23d, 1864.
Private C. C. Daggart, Veteran Reserve Corps, December 13th, 1864.
Private John Dowler, Co. G, 2d District of Columbia Volunteers, October 10th, 1863.
Private S. W. Duvall, Co. D, 12th Kentucky Volunteers, January, 1865.
Private James English, Co. K, 3d Massachusetts Heavy Artillery, January 9th, 1865.
Private John Fitzgibbons, Co. B, 13th New York Artillery, December, 1863.
Thomas Geary, Quartermaster's Department, July 15, 1864.
W. W. Hopkins, Recruit, 5th Michigan Volunteers, April 26th, 1865.
Thomas Jordan, employé, Quartermaster's Department, March 31st, 1865.
Private William Johnson, 10th New Hampshire Volunteers, December, 1863. Deserted.
Sergeant W. Leroy, Co. G, 4th United States Artillery, October 25th, 1864.
Private Edward Lowry, Co. E, 1st Veteran Reserve Corps, April 21st, 1864.

Private David McBride, Co. A, 18th Iowa Volunteers, October 17th, 1863.
Private Michael McCabe, Co. H, 4th Wisconsin Volunteers, January 22d, 1865.
Private Jerry McCarty, Co. C, 8th Illinois Cavalry, February 1st, 1864.
Private Daniel McLaughlin, Co. E, McClellan Guard, June 27th, 1863. Deserted.
Private Patrick Martin, Co. E, 88th New York Volunteers, May 24th, 1865.
Sergeant L. Martindale, Co. G, 2d Maine Cavalry, August 13th, 1865.
Private John Moony, Co. H, 5th Connecticut Volunteers, November 29th, 1863.
Private John Moore, Co. D, First Battalion California Volunteers, December 12th, 1863.
Private Kenneth Newton, Co. K, 38th Illinois Volunteers, December 10th, 1864.
Private Edward Ormsby, Co. I, 145th New York Volunteers, November, 1863.
Corporal Daniel Parker, Co. D, 73d New York Volunteers, February 7th, 1863.
Sergeant J. D. Place, Co. F, 75th Illinois Volunteers, December 11th, 1864.
Corporal Jacob Paul, Co. E, 16th Illinois Volunteers, December 14th, 1864.
Private W. E. Redding, Co. G, 2d Tennessee Mounted Infantry, January 20th, 1865.
Private M. J. Rice, Co. I, 110th Pennsylvania Volunteers, May, 1863.
Private Peter Smith, Co. C, 1st Missouri Artillery, December 22d, 1864.
Private James E. Shay, Co. F, 22d Illinois Volunteers, May 24th, 1864.
Private John Scott, 2d Indiana Battery, January 27th, 1865.
Private Jacob Smith, 110th Ohio Volunteers, October 4th, 1864.
Private Silas M. Smith, Co. C, 15th Illinois Cavalry, November 14th, 1863.
Private Charles Trucksiss, Co. C, 16th Veteran Reserve Corps, September 11th, 1864.
Private Edward Woodruff, Ordnance Corps, January 1st, 1865.
Private Francis Wirtz, Co. L, 1st Missouri Artillery, November 20th, 1863.
Private John Williams, Ordnance Corps, January 1st, 1865.

Cases.—The seven following men received injuries of the head from blows, which were followed by grave complications:

Private G. H. Cutting, Co. D, 8th Delaware Volunteers. Blow from spade. May, 1865. Otorrhea followed. Mustered out July 22d, 1865.

Private Joseph Edwards, Co. A, 28th Illinois Volunteers. Laceration of forehead by a billet of wood. May, 1864. Severe erysipelas. Duty, June 30th, 1864.

Private Henry Loughwell, Co. H, 15th Ohio Volunteers. Contusion of frontal region by a billet of wood, November 25th, 1864. Discharged, June 10th, 1865.

Private Michael Miller, 27th Co., 7th Regiment, V. R. C., aged 52. Severe contusion of scalp and concussion of the brain from a blow by a whip handle, May 14th, 1865. Discharged, November 14th, 1865.

Private A. Robinson, 6th Michigan Cavalry, aged 24. Laceration of forehead by a slung shot, May 23d, 1865. Discharged, July 3d, 1865.

Corporal William Warner, Co. F, 7th Michigan Volunteers, aged 24. Partial paralysis of the left arm from a blow from a fence rail, in action, Gettysburg, July 3d, 1863. Transferred to 2d Co., 1st Battalion, V. R. C., September 4th, 1863.

Private James Whissen, Co. F, 13th Ohio Cavalry, aged 21, was struck on the head with a pick-axe, February 16th, 1864. October 1st he was sent to a hospital at Alexandria, with violent epileptic convulsions. These continued to recur, and he was discharged from service March 18th, 1865.

The fourteen following abstracts afford examples of fractures of the cranium by blows from various blunt weapons:

Case.—Seaman James R. Connor, U. S. Steamer Arletta, aged 19 years, was admitted to the Post Hospital at Beaufort, North Carolina, October 31st, 1864, on account of a blow upon his head by an iron stanchion on the previous day. The blow had caused a fracture of the vault of the cranium. The patient died November 1st, 1864. Surgeon N. P. Rice, U. S. V., reports the case, without particulars of the treatment.

Case.—Sergeant J. G. Garrabrant, Co. C, 39th New Jersey Volunteers, aged 39 years, was admitted to the Ward Hospital, Newark, New Jersey, on January 8th, 1865, in an insensible condition, with a fracture of the cranium and compression of the brain, resulting from a blow received in a street affray a few hours previously. He never regained consciousness, and died on January 12th, 1865. At the autopsy, the arachnoid membrane was highly congested, and the smallest vessels were visible. Upon the anterior portion of the right lobe of the cerebrum, between the dura mater and arachnoid, there was a clot of blood several inches in diameter. The other portion of the brain was normal. The internal table of the occipital was found to be fractured in two places, extending from the torcular Herophili to the foramen magnum. The case is reported by the late Assistant Surgeon J. Theodore Calhoun, U. S. A.

Case.—Private John W. Hogener, Co. E, 120th Ohio Volunteers, received, on board a transport steamer, a blow from an iron bolt, which caused a fracture of the frontal bone. He was admitted to Hospital No. 11, at New Albany, Indiana, on November 18th, 1863, and died, on November 21st, 1863, from compression of the brain. Acting Assistant Surgeon A. M. Clapp reports the case.

Case.—David H———, U. S. Marine Corps, aged 35 years, was admitted to the post hospital at Vicksburg, Mississippi, February 24th, 1866, with all the toes frost-bitten. This seemed to constitute the only trouble, with the exception of a slight headache, which was attributed to the constipated condition of his bowels for three or four days prior to admission. An

aperient was ordered, with simple dressings to the feet. Until February 27th, there was a gradual improvement in the local lesion, but the dull, heavy pain in the head continued, with poor appetite, and costive bowels. On February 28th, the patient was found comatose, and for the first time there was noticed a slight paralysis of the right side. An incised wound of the scalp, an inch or more in length, was discovered in front of the left parietal protuberance. A crucial incision was made, and the flaps were reflected, with a view of trephining in the event of a fracture of the skull with depression, but as no lesion of the skull could be detected, the incision was closed. No other injury of the scalp was found after careful examination. The coma and paralysis were ascribed to apoplectic effusion. The patient expired at three o'clock on the morning of the following day. The antecedent history of this patient could not be ascertained, and Acting Assistant Surgeon G. F. Rockwell, who attended and reported the case, remarks that he was restricted to inferences from the clinical history and what the autopsy revealed. On removing the calvarium he found a small coagulum, but its location was not under the site of the external wound, but a little back of the coronal suture, on the left side, where the internal table was slightly depressed. But the chief difficulty was on the right side. When the skull-cap was lifted between two and three ounces of blood escaped, still leaving a coagulum covering the whole hemisphere. There was a semicircular fissure of the external table just in front of the left parietal protuberance, and stellate fissuring, with slight depression of the inner table, including a surface one inch in diameter. From this point a fissure, involving both tables, extended to the centre of the left branch of the lambdoidal suture. There were no traces of attempt at repair. There must have been a rupture of some of the larger vessels to cause such profuse extravasation of blood. There was no external wound of the scalp over the fracture of the left parietal. The specimen (FIG. 16) was contributed to the Army Medical Museum by Dr. Rockwell, who believed that the weapon employed must have been a billet of wood, or something of that nature.

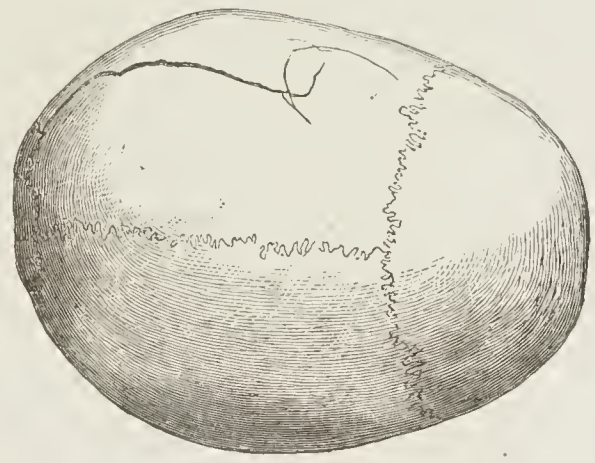

FIG. 16.—Fracture of the left parietal by a blow from a blunt weapon.—*Spec.* 2876, Sect I, A. M. M.

CASE.—Private William Horan, U. S. Marine Corps, aged 43 years, was admitted to Armory Square Hospital, Washington, May 14th, 1865, with a bruise of the left side of the forehead, received in a street fight a few hours previously. The injury was regarded as a simple contusion of the scalp, and was treated as such. On May 20th, the patient suddenly became comatose, and death took place on the following day, May 21st, 1865. The *post mortem* examination revealed a slight fissure of the outer, and a considerable depression of the inner table. An abscess of considerable size extended for some distance beneath the frontal bone. Surgeon D. W. Bliss, U. S. V., reports the case.

CASE.—Corporal Michael Lynch, Co. H, 45th New York Volunteers, aged 33 years, was struck with a club July 1st, 1864. He was admitted into the hospital of the 2d Division 2d Corps on the same day, and was transferred to Stanton Hospital, in Washington, on July 4th. Surgeon John A. Lidell, U. S. V., who reports the case, found that there was a comminuted fracture of the right temporal bone. Cerebral inflammation supervened, and the patient died July 14th, 1864.

CASE.—Private *E. C. M*———, Co. D, 28th Alabama Infantry, a prisoner of war at Rock Island, Illinois, was killed by a fellow prisoner, August 14th, 1864, by a blow on the right temporal region with a board. Death was almost instantaneous. At the autopsy, it was found that the skull was remarkably thin, and that a nearly vertical fissure extended through the squamous portion of the temporal, the great wing of the sphenoid, and nearly to the median line of the frontal bone, bifurcating an inch from its termination. The right orbital plate of the frontal, which was extremely thin, was fissured either by *contre coup*, or by the impulse communicated through the cerebral substance. There was diastasis of the squamo-sphenoid suture. Large branches of the meningeal arteries were ruptured, and death resulted, probably, from hæmorrhage in the cavity of the cranium. But the condition of the brain and its membranes, and the extent of the intracranial bleeding, were not reported. The specimen is delineated in the adjacent wood-cut, (FIG. 17.) By an inadvertence of the engraver in copying the photograph, the specimen appears reversed, and represents a fracture of the *left* instead of the right side.

FIG. 17.—Fracture of the temporal by a blow from a board.—*Spec.* 2862, Sect. I, A. M. M.

CASE.—Private J. M. Munroe, Co. E, 26th Massachusetts Volunteers, was admitted to St. James Hospital, New Orleans, February 23d, 1863, with a fracture of the skull, produced by a blow. He recovered, under expectant treatment, and was discharged from service on May 12th, 1863. The case appears on the report of Assistant Surgeon J. Homans, U. S. A.

CASE.—Private John Murray, Co. D, 6th Illinois Cavalry, aged 23 years, was struck on the head by a slung shot, in the streets of Memphis, Tennessee, April 7th, 1864. He was admitted, on the same day, to Adams Hospital, and his case is recorded on the register of that hospital as a contused wound of the scalp. He was furloughed on July 8th, and admitted to Knight Hospital, New Haven, Connecticut, on August 24th. He was furloughed from this hospital on September 9th, and re-admitted as unable to travel, two days subsequently. He was again furloughed on November 2d, 1864, and re-admitted from furlough November 15th, and, according to the monthly report of Surgeon P. A. Jewett, U. S. V., in charge of Knight Hospital, was discharged from service on November 16th, 1864, on account of total physical disability, resulting from fracture of the skull. The certificate states that the man was unfit for duty in the Veteran Reserve Corps.

CASE.—Private Francis M. Pettit, Co. G, 12th Kansas Volunteers, is reported by Surgeon C. R. Stuckslager, 12th Kansas Volunteers, as having received a compound fracture of the left parietal bone, a little in advance of the protuberance, by a blow from the handle of a table fork. There was depression of bone, with injury of the membranes of the brain, and the patient died a few days after the injury, May 7th, 1863. A *post mortem* examination was made, which disclosed indications of softening of the brain and meningitis.

CASE.—Private Michael Smith, Co. F, 7th United States Infantry, arrived at Fort Bascom, New Mexico, August 10th, 1863, and, on August 20th, he applied to Acting Assistant Surgeon S. Rankin, to have his head dressed. Dr. Rankin found a fistulous opening on the right frontal protuberance. The man related that, six months previously, at Fort Union, he had received, in an affray, a blow which had broken his head, and that a little matter had flowed from the wound ever since. A simple dressing was applied, and the man did not report again on the sick list until September, 1863, when, after getting on a frolic, he was attacked with grave symptoms of cerebral disorder, and died, from cerebritis, September 20th, 1863. At the *post mortem* examination, Dr. Rankin found a piece of bone two inches long and one inch wide, consisting of the inner table, altogether detached, lying pressing upon the brain, which had undoubtedly been in the same situation the previous spring when he received the injury.

CASE.—Alfred Sypole, Farrier, Co. M, 4th Virginia Cavalry, on February 26th, 1864, was knocked down by a blow from an axe, while making a furious assault upon a non-commissioned officer of his company. For several hours afterwards he was insensible, and then partially recovered; but remained moody and stupid. On March 2d, he was admitted into the post hospital at New Creek, West Virginia, under the care of Surgeon S. B. Smith, U. S. V., who reports the case. Dr. Smith found a small wound, suppurating freely, over the left temporal bone, and a fracture without depression. The mental faculties were confused. The patient complained of severe pain on the opposite side of the head. An emollient poultice was applied to the seat of injury, and a brisk cathartic was ordered, which promptly relieved the pain in the head, and was followed by a restoration of clearness of intellect. At this time, the patient seemed to convalesce rapidly. In two days, he walked about and enjoyed himself, entering freely into general conversation, and expressing himself with ease and clearness. On the evening of the 16th, he became sullen and depressed in spirits, and had a recurrence of severe pain on the opposite side of the head from the wound. On the following morning, the patient had convulsions, and death took place in a short time, March 17th, 1864. On a *post mortem* examination, it was found that there was a fracture of the temporal bone, triangular in shape, an inch and a half in length, and about one inch in width at the base. The dura mater was not injured, and the bone was not depressed. In the middle lobe of the left hemisphere there was an abscess near the fracture containing an ounce and a half of pus. No abnormal appearances could be detected on the opposite side of the brain, where the intense pain had been experienced. There was but little injection, anywhere, of the pia mater.

CASE.—Private James Wiggins, Co. C, 1st U. S. Cavalry, was admitted to the Balfour Hospital, Portsmouth, Virginia, April 10th, 1865, with compression of the brain, resulting from a fracture of the frontal bone by a blow over the left superciliary ridge, received a few hours before admission. The roof of the orbit was depressed, as well as the lower part of the skull, over the anterior portion of the left hemisphere. An operation was deemed inexpedient. Cold applications to the head, blisters to the nape of the neck, and stimulants, constituted the treatment. Assistant Surgeon J. H. Frantz, U. S. A., reported the case.

CASE.—Private *J. R. Wilkinson*, Co. B, 46th Virginia Regiment, was struck on the head by an iron bar, used in starting a steam engine, and had a fracture of the right parietal bone. He was treated at the Farmville Hospital, Virginia, on the expectant plan. Epileptic convulsions ensued, and the patient was discharged from service, permanently disabled, on September 23d, 1864. Surgeon H. D. Taliaferro, C. S. A., records the case on his monthly report.

The following are examples of contused and lacerated wounds of the scalp produced by stones, bricks, and similar missiles:

CASES.—An officer and eight men of the 6th Massachusetts Militia received contusions or lacerations of the scalp, by paving stones, bricks, etc., on the occasion of the memorable attack upon that Regiment by insurgents in Baltimore, on April 19th, 1861:

Privates G. Alexander, C. H. Chandler, and Sergeant W. H. Lamson, of Co. D; Sergeant G. G. Durrell, Co. D; Lieut. James F. Rowe, of Co. L; Privates S. Flanders, J. Porter, J. Pennell, and Charles B. Stinson, of Co. C. These patients were conveyed, by rail, to Washington, and were treated in the E Street Infirmary, under charge of Surgeon Norman Smith, 6th Massachusetts Volunteers, and the late Dr. J. Sim Smith, Assistant Surgeon, U. S. A.

CASES.—The twenty-two men named below are reported as having been treated in various hospitals for contused or lacerated scalp wounds, produced by bricks or stones, and returned to duty, after a comparatively brief period of treatment:

Private James Armstrong, Co. K, 7th Pennsylvania Reserves, October 4th, 1863.
Private Anthony Babano, Co. C, 46th Indiana Volunteers, April 16th, 1865.
Private Wm. Bowles, Co. A, 1st Michigan C. T., September 17th, 1864.
Corporal F. B. Cox, I, 22d Pennsylvania Cavalry, May 30th, 1865.
Sergeant F. A. Cullin, D, 22d Veteran Reserve Corps, July 9th, 1864.
Private J. R. Davenport, H, 84th New York Volunteers, July 1st, 1863.
Private E. Enghausen, K, 1st New York Light Artillery, June 1st, 1865.
Private J. Ginn, C, 36th Indiana Volunteers, November 27th, 1863.
Private F. P. Green, D, 205th, Pennsylvania Volunteers, May 26th, 1865.
Private G. W. Hamilton, K, 86th Illinois Volunteers, July 1st, 1864.
Private R. D. Herron, A, 23d Michigan Volunteers, December 22d, 1864.

Private B. Hockworth, I, 1st West Virginia Infantry, April 18th, 1864.
Private T. Kelley, A, 14th Tennessee Cavalry, December 20th, 1864.
Private J. Kennedy, L, 1st Missouri Engineers, August 16th, 1864.
Private W. Locke, G, 23d Veteran Reserve Corps, March 18th, 1865.
Private M. Lope, A, 22d Ohio Volunteers, June 29th, 1865.
Private T. Minnan, Ordnance Corps, March 10th, 1865.
Private A. Newhauser, G, 1st Illinois Artillery, April 29th, 1865.
Private P. Rhodes, D, 18th Iowa Volunteers, October 1st, 1863.
Private W. Sallee, Ordnance Corps, January, 1865.
Corporal J. W. Smithers, B, 27th Massachusetts Volunteers, May 11th, 1864.
Private C. H. Winn, I, 35th Illinois Volunteers, May, 1864.

The three following are cases of fractures of the skull from the causes last mentioned:

CASE.—Private John Aldrich, Co. K, 176th New York Volunteers, aged 29 years, in an attack of delirium, struck his head with a stone, on July 25th, 1864, producing a compound fracture of the cranium. He was admitted to the University Hospital, at New Orleans, Louisiana, on the following day. An abscess formed and the patient died, on August 15th, 1864, from inflammation of the brain. Surgeon Samuel Kneeland, U. S. V., reports the case.

CASE.—Corporal Adam Gaslein, Co. B, 6th Pennsylvania Cavalry, had a simple fracture of the vault of the cranium, in April, 1863, caused by a blow from a stone. He was admitted to Columbian Hospital, Washington, on April 4th, 1863. He had a very protracted convalescence, and finally recovered perfectly, and returned to duty, April 12th, 1864. Surgeon T. R. Crosby, U. S. V., reports the case.

CASE.—Private Daniel T. Swartz, 7th West Virginia Cavalry, aged 35 years, had a laceration of the forehead, and a compound fracture of the left side of the frontal bone, from a blow by a brick-bat, on April 1st, 1865. He was admitted to Washington Hospital, Memphis, Tennessee, where the hæmorrhage, which had been very profuse, was arrested, and the wound dressed simply, there being no indications of depression of bone or of intracranial extravasation of blood. On May 15th, the patient was transferred to Gayoso Hospital. On May 24th, he was considered cured, and returned to duty. Surgeon Daniel Stahl, U. S. V., reports the case.

UNSPECIFIED CAUSES.—Many men also were received into general hospital for contusions or lacerations of the scalp, or for concussion of the brain, or fracture of the skull, and were reported by name, but without any indication of the precise cause of their injuries:

CASES.—The one hundred and twenty-one men enumerated in the following list recovered, and were returned to duty or discharged from service at the conclusion of the war after a brief period of treatment for such injuries as are mentioned above:

Private H. Ackerman, K, 18th Wisconsin Volunteers, Nashville, Tennessee, January 11th, 1865.
Private W. H. Alexander, C, 39th New Jersey Volunteers, Camp Frelinghuysen, New Jersey, October 24th, 1864.
Private J. Anderson, G, 4th Tennessee Cavalry, Vicksburg, Mississippi, February 20th, 1865.
Bugler G. W. Ashland, B, 12th Pennsylvania Volunteers, Sandy Hook, Maryland, May 12th, 1864.
Teamster C. Barachi, Indian Expedition, Fort Ridgely, Minnesota, May 31st, 1864.
Private T. Barber, H, 118th New York Volunteers, Petersburg, Virginia, June 2d, 1865.
Private D. Bon, C, 2d Missouri Artillery, Cape Girardeau, Missouri, December 20th, 1863.
Private B. S. Boorman, G, 41st Ohio Volunteers, Nashville, Tennessee, December 13th, 1864.
Private W. J. Brown, E, 14th Illinois Cavalry, Nashville, Tennessee, February 9th, 1865.
B. Busa, Government Employé, Washington, D. C., February 17th, 1864.
Recruit J. Cain, Merrill's Horse, St. Louis, Missouri, November 8th, 1864.
Lieutenant H. D. Call, A, 76th New York Volunteers, Georgetown, D. C., January 9th, 1864.
Private J. Cantrell, Schofield Hussars, St. Louis, Missouri, December 8th, 1863.
Private W. C. Carroll, B, 4th Tennessee Volunteers, Louisville, Kentucky, March 30th, 1863.
Private M. Casey, L, 1st Illinois Artillery, New Creek, West Virginia, November 10th, 1864.
Private A. R. Chapman, C, 32d Massachusetts Volunteers, Washington, D. C., May 23d, 1865.
Private J. Chase, G, 4th Michigan Cavalry, Nashville, Tennessee, March 6th, 1864. Deserted.
Private J. Christie, A, 18th New York Cavalry, New Orleans, Louisiana, April 26th, 1865.
Private *W. M. Clare*, G, 20th Missouri Regiment, Farmville, Va.
Private H. W. Cochran, I, 17th Indiana Volunteers, Louisville, Kentucky, November 30th, 1864.
Private B. Cofflety, G, 77th Pennsylvania Volunteers, Nashville, Tennessee, December 15th, 1864.
Private J. Cox, A, 13th New York Cavalry, Washington, D. C., August 11th, 1864.
Recruit J. E. Cranfield, 63d New York Volunteers, Alexandria, Virginia, May 8th, 1864.
Private W. Daly, A, 16th United States Infantry, Nashville, Tennessee, December 18th, 1865.
Private W. Danekas, E, 11th Illinois Volunteers, Memphis, Tennessee, April 6th, 1865.
Private L. L. Davis, C, 15th New Jersey Volunteers, Washington, D. C., May 11th, 1864.
John Dugan, Government Employé, Quartermaster's Department, Nashville, Tennessee, November 28th, 1864.
Private H. Dunham, I, 6th Missouri Volunteers, Nashville, Tennessee, December 9th, 1864.

Corporal S. Eplar, C, 2d Minnesota Cavalry, Fort Ridgely, Minnesota, April 13th, 1864.
Private J. Ervay, A, 10th Michigan Volunteers, Knoxville, Tennessee, April 24th, 1864.
Private A. C. Ewing, C, 28th Kentucky Volunteers, Louisville, Kentucky, June 15th, 1865.
Private C. Farnsworth, A, 3d Ohio Cavalry, New Albany, Indiana, April 10th, 1864.
Private J. Fitzgerald, 21st Wisconsin Volunteers, Nashville, Tennessee, November 2d, 1864.
Private M. Flaherty, C, 49th Missouri Volunteers, St. Louis, Missouri, November 17th, 1864.
1st Sergeant A. B. Francisco, F, 124th New York Volunteers, Chester, Pennsylvania, May 30th, 1864.
Corporal G. Gamble, A, 27th Pennsylvania Volunteers, Nashville, Tennessee, May 13th, 1864.
Private P. Gannon, K, 39th Massachusetts Volunteers, Boston, Massachusetts, May 9th, 1864.
Sergeant *J. N. Gilchrist*, K, 5th Alabama Infantry, Richmond, Virginia, June 4th, 1864.
Corporal T. Gleason, E, 63d New York Volunteers, Nashville, Tennessee, September 7th, 1865.
Private J. G. Gossman, B, 176th Ohio Volunteers, Nashville, Tennessee, August 2d, 1864.
Private A. Grant, H, 59th Indiana Volunteers, Tullahoma, Tennessee, September 1st, 1864.
Private J. B. Griffith, I, 95th Pennsylvania Volunteers, Washington, D. C., May 14th, 1864.
Sergeant C. B. Hadley, B, 56th Massachusetts Volunteers, Boston, Massachusetts, April 21st, 1864.
Private *W. Hatsell*, B, 6th Kentucky Regiment, Nashville, Tennessee, September 24th, 1863.
Private H. Henning, E, 8th Iowa Cavalry, in action, Tuscaloosa, Alabama, April 3, 1865.
Private *J. M. Heevey*, A, 56th Georgia Infantry, Nashville, Tennessee, February 16th, 1864.
Private J. Hickey, D, 23d Maryland Volunteers, Louisville, Kentucky, June 25th, 1865.
Private E. B. Hieronymus, B, 7th Missouri State Militia Cavalry, St. Louis, Missouri, March 30th, 1865.
Private M. Higgins, L, 2d Massachusetts Artillery, Portsmouth, Virginia, July 1st, 1865.
Private F. Howe, G, 6th Vermont Volunteers, January 6th, 1865.
Private J. Hudson, C, 2d United States Infantry, Elmira, New York, January 7th, 1865.
Private J. Jenks, F, 51st New York Volunteers, Alexandria, Virginia, April 23d, 1864.
Private J. James, Unassigned Substitute, Elmira, New York, May 7th, 1865.
Sergeant W. A. Johnson, A, 15th Indiana Battery, Washington, D. C., February 17th, 1865.
Private J. Kanally, K, 35th Indiana Volunteers, Louisville, Kentucky, February 22d, 1864. Erysipelas.
Private D. Kelly, K, 73d Pennsylvania Volunteers, Philadelphia, Pennsylvania, July 8th, 1863. Deserted.
Private E. A. Knapp, I, 89th Illinois Volunteers, Nashville, Tennessee, May 29th, 1864.
A. Kruse, Contract Nurse, Washington, D. C., May 15th, 1864.
Corporal T. Langley, E, 10th United States Colored Troops, Portsmouth, Virginia, May 27th, 1865.
Private A. J. Little, H, 5th Missouri State Militia Cavalry, Rolla, Missouri, July 4th, 1864.
Private J. S. Lockwood, A, 17th Connecticut Volunteers, St. Augustine, Florida, June 11th, 1864.
Private J. McAldee, 2d Indiana Battery, Nashville, Tennessee, February 16th, 1865.
Private B. McCarty, B, 21st Connecticut Volunteers, Portsmouth, Virginia, May 5th, 1865.
Private R. McCarty, B, 40th Missouri Volunteers, St. Louis, Missouri, November 6th, 1864.
Private C. McDonald, C, 19th Massachusetts Volunteers, in action, Wilderness, Virginia, May 6th, 1864.
Private N. McEnroe, F, 2d New York Volunteers, Newark, New Jersey, June 6th, 1864.
Private P. McGevi, B, 10th Tennessee Volunteers, Nashville, Tennessee, November 6th, 1864.
Private M. McKenney, I, 1st United States Artillery, Gettysburg, Pennsylvania, July 3, 1863.
Private C. McMahon, I, 5th Missouri State Militia Cavalry, St. Louis, Missouri, January 1st, 1865.
Private P. Mahon, F, 20th Connecticut Volunteers, Aquia Creek, Virginia, May 4th, 1863.
Private F. Marrais, 7th Massachusetts Battery, New Orleans, Louisiana, March 18th, 1864.
Private J. Marity, G, 1st Michigan Engineers, Louisville, Kentucky, March 15th, 1864.
Private M. Miller, C, 2d Ohio Heavy Artillery, Bowling Green, Kentucky, October 22d, 1863.
Private W. Missor, G, 87th Illinois Volunteers, St. Louis, Missouri, December 18th, 1862. Deserted.
Private S. W. Morgan, G, 1st Indiana Artillery, New Orleans, Louisiana, January 8th, 1864.
Private W. J. Mowry, K, 11th Illinois Cavalry, Vicksburg, Mississippi, February 24th, 1864.
Sergeant J. Murphy, D, 2d Maryland Cavalry, Annapolis, Maryland, August 27th, 1863.
Private M. Murray, C, 6th New York Heavy Artillery, Washington, D. C., August 16th, 1864.
Private J. F. Neal, F, 55th Kentucky Volunteers, Louisville, Kentucky, May 26th, 1865.
Private T. Newell, D, 6th Kentucky Cavalry, Louisville, Kentucky, March 18th, 1864.
Private J. O. Barker, H, 9th United States Colored Troops, Portsmouth, Virginia, May 27th, 1865.
Private J. O'Hara, D, 2d Massachusetts Heavy Artilley, Boston, Massachusetts, September 12th, 1865.
Private *W. Palmer*, B, 26th Virginia Infantry, June 17th, 1864.
Sergeant A. M. Parmenter, E, 29th Michigan Volunteers, Louisville, Kentucky, October 11th, 1864.
W. Parker, Substitute, 16th Kentucky Volunteers, Nashville, Tennessee, December 9th, 1864. Deserted.
Orderly Sergeant T. Pepper, United States Army, Covington, Kentucky, June 18th, 1865.
Private W. H. Perry, K, 6th Illinois Volunteers, Nashville, Tennessee, July 28th, 1865.
Private J. M. Pierce, H, 6th Indiana Volunteers, Chattanooga, Tennessee, November 25th, 1863.
Private L. E. Porter, H, 109th New York Volunteers, Baltimore, Maryland, August 23d, 1864.
Private J. Riley, D, 4th United States Infantry, New York, August 30th, 1865.
Private J. Ritchey, H, 18th Kentucky Infantry, Murfreesboro, Tennessee, September 26th, 1863.
Private M. Rodgers, D, 14th United States Infantry, Elmira, New York, January 7th, 1865. Deserted.
A. Rosa, Blacksmith, L, 1st Illinois Artillery, Vicksburg, Mississippi, May 29th, 1864.
Private R. Scerter, G, 30th Indiana Volunteers, Nashville, Tennessee, May 19th, 1864.

Private J. Scribner, D, 11th Missouri Cavalry, St. Louis, Missouri, December 28th, 1864.
Corporal L. Seiper, E, 40th Missouri Volunteers, St. Louis, Missouri, November 7th, 1864.
Private D. Smallwood, C, 15th United States Colored Troops, Nashville, Tennessee, August 19th, 1865.
First Lieutenant A. Smith, D, 51st New York Volunteers, Alexandria, Virginia, May 18th, 1865.
Recruit C. Smith, 14th New York Artillery, Elmira, New York, December 29th, 1863.
Private D. Smith, D, 1st Wisconsin Cavalry, Nashville, Tennessee, March 9th, 1864.
Private H. Smith, A, 68th New York Volunteers, Nashville, Tennessee, December 16th, 1864.
Private I. Smith, D, 31st Maine Volunteers, Boston, Massachusetts, April 18th, 1864.
Private J. Smith, A, 9th New York Volunteers, New York, July 20th, 1863. Deserted.
Private J. Smith, B, 18th New York Cavalry, Washington, D. C., February 14th, 1864. Deserted.
Private J. Smith, C, 10th Tennessee Mounted Infantry, Nashville, Tennessee, May 4th, 1864.
Private W. A. Smith, F, 1st Delaware Volunteers, Wilderness, Virginia, May 5th, 1864.
Private J. Spencer, A, 179th Ohio Volunteers, Louisville, Kentucky, October 6th, 1864.
Private T. Sullivan, F, 52d Illinois Volunteers, Louisville, Kentucky, June 21st, 1865.
Corporal J. Suter, E, 7th Veteran Reserve Corps, Louisville, Kentucky, July 19th, 1864.
Private J. Sutter, K, 1st Michigan Cavalry, Washington, D. C., March 2d, 1864.
Private *W. C. Swanson*, K, 12th North Carolina Infantry, Richmond, Virginia, April 28th, 1863.
Private E. Sweat, F, 93d New York Volunteers, Wilderness, Virginia, May 5th, 1864.
Private E. Taylor, F, 3d Ohio Cavalry, Nashville, Tennessee, June 8th, 1864.
Private *D. W. Vicks*, C, 50th Georgia Regiment, Richmond, Virginia, June 5th, 1863
Private W. Visser, G, 82d Illinois Volunteers, Ballesville, Illinois, December 18th, 1862. Deserted.
Private J. Walcott, I, 50th Ohio Volunteers, Baltimore, Maryland, February 4th, 1865.
Corporal P. Walton, I, 111th Pennsylvania Volunteers, Savannah, Georgia, February 1st, 1865.
Corporal C. Williams, M, 2d Massachusetts Volunteers, Worchester, West Virginia, January 23d, 1865.
Private T. Wilson, M, 3d United States Cavalry, Little Rock, Arkansas, February 19th, 1866.
Private H. Wolf, B, 9th New York Cavalry, Washington, D. C., June 26th, 1865.
Private G. B. Young, B, 64th United States Colored Troops, Vicksburg, Mississippi, July 31st, 1865.

The following are examples of graver injuries belonging to the foregoing category:

CASE.—Private Frederick Burling, Co. D, 23d New York Volunteers, aged 21 years, received a severe injury of the head, at Upton's Hill, Virginia. Deafness and partial paralysis ensued, and he was discharged from service on March 1st, 1862.

CASE.—Private O. B. Cook, Co. H, 14th Vermont Volunteers, received a severe injury of the head, at Fairfax Court House, Virginia, January 4th, 1863, and was discharged for disability, rated at one-half, on March 24th, 1863. Surgeon A. T. Woodward, 14th Vermont Volunteers, records the case.

CASE.—Private Milton Crowell, Co. B, 84th Illinois Volunteers, received a contused wound of the head, in May, 1863, and was admitted to Gayoso Hospital, Memphis, Tennessee, June 1st. Cerebral complications arose, and he died on June 5th, 1863. Surgeon D. W. Hartshorn, U. S. V., records the case.

CASE.—Private Edward Garnett, Co. B, 5th Ohio Volunteers, at Camp Banks, in the spring of 1863, received an injury of the head, which resulted in impairment of the mental faculties. Complete loss of memory was a remarkable feature of the case. The patient was discharged for total disability by order of Surgeon R. O. Abbott, U. S. Army, the Medical Director of the Department of Washington, March 3d, 1863. The case is recorded by Assistant Surgeon J. H. Withers, U. S. V.

CASE.—W. F. Kirkland, a recruit of the 16th New York Cavalry, aged 43 years, received a lacerated wound of the scalp in the frontal region, May 4th, 1864, and was admitted to Camden Street Hospital, Baltimore. Erysipelas of the scalp supervened, and was followed by meningeal inflammation. The patient died on May 13th, 1864. Surgeon Z. E. Bliss, U. S. V., records the case.

CASE.—Private Thomas Morrissey, Co. A, 2d Vermont Volunteers, aged 26 years, was admitted to Lincoln Hospital, Washington, April, 1863, under the charge of Surgeon H. Bryant, U. S. Volunteers, on account of a contusion of the head. Symptoms of arachnitis were manifested; but the patient recovered partially, was transferred to a convalescent camp near Alexandria, on March 10th. He was discharged from service on March 20th, 1863. His mental faculties were much impaired. His disability was rated at two-thirds. Surgeon S. B. Hunt, U. S. V., records the case.

CASE.—Sergeant Richard M. Porter, 37th Massachusetts Volunteers, aged 28 years, received a contusion of the scalp, in July, 1864. He was admitted into Augur Hospital, and, on August 2d, he was transferred to the 3d Division Hospital, at Alexandria, with symptoms of incipient cerebritis. He died, August 28th, 1864. Surgeon E. Bentley, U. S. V., records the case.

CASE.—Private Thomas Solomon, Co. F, 2d Louisiana Mounted Infantry, aged 50 years, received, in camp, near Greenville, Louisiana, June 18th, 1864, a contused wound of the scalp. On June 20th, he was transferred to University Hospital, New Orleans, and on December 21st, 1864, he was transferred to the Veteran Reserve Corps.

The following are abstracts of cases of simple or compound fractures of the skull, produced by causes not specified, save that it is stated that they were not inflicted by gunshot:

CASE.—Private *Robert Bibb*, Co. E, 4th Virginia Regiment, was admitted, March 31st, 1864, into the hospital at the Old Capitol Prison, Washington, with a simple fracture of the skull. He died, April 6th, 1866.

CASE.—Private James Burns, Co. B, 39th Massachusetts Volunteers, aged 57 years, was admitted to Stanton Hospital, Washington, on July 14th, 1863, with a fracture of the cranium. He was transferred to Satterlee Hospital, Philadelphia, on May 10th, 1864, and returned to duty October 18th, 1864. Surgeon I. I. Hayes, U. S. V., records the case.

CASE.—Private Peter Cahill, Co. C, 79th New York Volunteers, aged 19 years, received an accidental compound fracture of the external table of the frontal bone, June 14th, 1865, while serving on the Provost Marshal's Guard. He was admitted to Sickel Hospital, Alexandria, on June 14th, and discharged from service well, on July 4th, 1865. Surgeon E. Bentley, U. S. V., records the case.

CASE.—Private W. H. Christ, Co. I, 126th Ohio Volunteers, aged 24 years, was admitted to the base hospital, at City Point, Virginia, with a lacerated wound of the scalp, and fracture of the skull, April 24th, 1865. He was transferred to Patterson Park, Baltimore, May 18th, to Hick's Hospital, convalescent, June 8th, and discharged from service, well, June 17th, 1865. Surgeon Thomas Sim, U. S. V., records the case.

CASE.—Private *Peter Clofat*, Co E, 2d Louisiana Regiment, was sent to the St James Hospital, New Orleans, on May 10th, 1863, by the Provost Marshal, with fracture of the skull. He died on the following day. Assistant Surgeon J. Homans, U. S. A., records the case.

CASE.—The body of private John C———, Co. K, 2d U. S. Infantry, aged 30 years, was brought into hospital, at Fort Columbus, New York Harbor, on January 21st, 1865. It was found that life was entirely extinct. There was a contused and lacerated wound, three inches in length, behind the left ear, and a depressed fracture on the left side of the occipital. No clue whatever could be obtained as to the nature of the weapon by which the injury was inflicted; nor, indeed, could it be accurately determined whether it was due to a blow, or to a fall. At the autopsy, it was found that the medulla oblongata was torn away almost completely from the pons Varolii. There was great intracranial extravasation of blood, and a fracture extending across the occipital and temporal bones to the left side of the foramen magnum. A fissure proceeded also through the right condyloid foramen into the mastoid process of the right temporal. Assistant Surgeon P. S. Conner, U. S. Army, forwarded to the Army Medical Museum the notes of the case, and a section of the skull, which is represented in the accompanying wood-cut, (FIG. 18.)

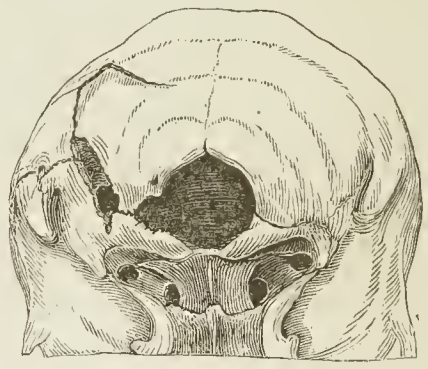

FIG. 18.—Section of base of cranium showing depressed fracture.—*Spec.* 4351, Sect. I, A. M. M.

CASE.—Captain *J. B. Forcum*, Co. H, 4th North Carolina Infantry, received, at Gettysburg, July 1st, 1863, a simple fracture of the cranium. He was admitted to Hospital No. 4, at Richmond, Virginia, and recovered, and was furloughed, August 3d, 1863. Surgeon J. B. Read, C. S. A., records the case.

CASE.—Bugler Morris Houlahan, Co. G, 5th U. S. Cavalry, was admitted to the Seminary Hospital, Georgetown, December 11th, 1862, with a fracture of the skull, and died the same day. Acting Assistant Surgeon Landon Wells, records the case.

CASE.—Private John Hines, Co. D, 3d Michigan Volunteers, aged 39 years, received a fracture of the right side of the frontal bone, on October 28th, 1864. He was treated at Huntsville, Alabama; Nashville, Tennessee; Louisville, Kentucky; and recovered, and was discharged from service, June 9th, 1865. Surgeon B. B. Breed, U. S. V., records the case.

CASE.—Sergeant *R. W. Jones*, 1st Virginia Artillery, was admitted to Chimborazo Hospital, Richmond, Virginia, on November 17th, 1863, with a fracture of the skull. He recovered, and returned to duty, December 13th, 1863. Surgeon E. S. Smith, C. S. A., records the case.

CASE.—Private Michael McNulty, Co. E, 77th Pennsylvania Volunteers, aged 24 years, received a simple fracture of the frontal bone, December 10th, 1864, at Nashville, Tennessee. He was transferred to Louisville, thence to Camp Dennison, Ohio, and recovered, and was returned to duty, January 7th, 1865. Surgeon J. E. Herbst, U. S. V., records the case.

CASE.—Private Andrew Mader, Co. L, 3d Pennsylvania Artillery, received a simple fracture of the right parietal, December 13th, 1864. The line of fracture passed across the middle meningeal artery, which was ruptured, and gave rise to a large extravasation of blood. He was admitted to Balfour Hospital, Portsmouth, Virginia, with every symptom of compression of the brain. He died, December 16th, 1864. An autopsy revealed a large coagulum over the right hemisphere. Assistant Surgeon J. H. Frantz, U. S. A., records the case.

CASE.—Private George W. Morey, Co. E, 10th Michigan Volunteers, aged 23 years, received a contused wound on the left side of the head, at Tunnel Hill, Georgia, in April, 1864. The existence of fracture was suspected, but not clearly diagnosticated. The patient was treated at Hospital No. 19, Nashville, Tennessee, at Louisville, Kentucky, and at St. Mary's Hospital, Detroit, Michigan. He had frequent epileptic convulsions, and died in one of the paroxysms, May 25, 1864.

CASE.—Sergeant John Miller, Co. I, 2d Illinois Artillery, was admitted to Indianapolis Hospital, in September, 1862, with fracture of the skull. He died, September 17th, 1862. Surgeon J. S. Bobbs, Brigade Surgeon, U. S. V., records the case.

CASE.—Private Daniel W. Nash, Co. F, 31st Ohio Volunteers, received a simple fracture of the skull, in February, 1863. He was admitted to Hospital No. 10, at Louisville, Kentucky, and was discharged from service, February 28th, 1863. Acting Assistant Surgeon E. O. Brown, records the case.

CASE.—Teamster Washington Odell, Co. I, 98th Illinois Volunteers, received an injury of the skull in 1863. He was admitted to Camp Dennison Hospital, Ohio, and was discharged from service, on August 12th, 1863. Surgeon H. C. McAllister, 98th Illinois Volunteers, records the case.

CASE.—Private Stephen E. Potts, New York Marine Artillery, was admitted to Foster Hospital, Newberne, North Carolina, August 23d, 1862, with a simple fracture of the skull. He recovered, and was discharged from service, December 13th, 1863.

CASE.—Private Dennis Quinn, Co. F, 11th Veteran Reserve Corps, received, in September, 1864, a simple fracture of the frontal bone, with a slight depression. He was admitted to Judiciary Square Hospital, Washington, on September 24th, and recovered, and returned to duty on October 8th, 1864. Assistant Surgeon P. C. Davis, U. S. A., records the case.

CASE.—Private William Russell, 26th New York Battery, was admitted to the St. James' Hospital, New Orleans, Louisiana, on March 11th, 1863, with a simple fracture of the skull. He recovered, and was discharged from service, on May 11th, 1863. Assistant Surgeon John Homans, U. S. A., records the case.

CASE.—Private J. C. R———, Pennsylvania Artillery, aged 22 years, was admitted, on September 30th, 1864, to Jarvis Hospital, Baltimore, Maryland, in an inebriated condition, with a contusion of the left side of the face, and a small contused wound over the left malar bone. No history of the cause or circumstances attending his accident could be ascertained. Cold applications were made to the head, and he was kept quiet in bed. No symptoms of grave cerebral mischief appeared until the evening of October 5th, when he became noisily delirious. He became comatose, and died the following morning. *Sectio cadaveris* twenty-four hours after death. There was ecchymosis on the left side of the face; the left ramus of the lower jaw bore traces of an old gunshot fracture. There was also a gunshot fracture involving the right shoulder. On removing the scalp, dark blood oozed from the ruptured veins, and on removing the skull-cap and cerebrum, a clot of blood of from one and a half to two ounces was found between the frontal bone and dura mater on the left side, adhering to the membrane. It must, necessarily, have compressed greatly the anterior lobe of the left hemisphere. There was also a clot at the posterior surface of the posterior lobe of the right hemisphere. The cerebral substance was softened at this point. There was effusion of serum over the pons Varolii and in the third and fourth ventricles. The arachnoid membrane was considerably separated from the sulci by effusion into the subarachnoid cavity. The veins of the pia mater were everywhere turgid. The fracture commenced on the outer part of the left superciliary ridge, and passed across the left orbital plate of the frontal, fissuring the ethmoid, and the body of the sphenoid. The sphenoidal fissure on the left side was enlarged as though by absorption from without. Acting Assistant Surgeon B. B. Miles contributed the specimen, (FIG. 19,) with the notes in the case.

FIG. 19.—Fracture of the orbital plate of the frontal, the ethmoid, and sphenoid.—*Spec.* 3440, Sect. I, A. M. M.

CASE.—Private Frederick Seltzer, 5th U. S. Artillery, was admitted to the Seminary Hospital, Georgetown, D.C., January 8th, 1862, with a fracture of the skull. He died on January 12th, 1862. Surgeon Joseph R. Smith, U. S. A., records the case.

CASE.—Private *J. M. Sharp,* Co. F, 45th North Carolina Regiment, received a simple fracture of the zygoma of the right temporal, without injury to the cranial cavity. He was admitted to the Farmville Hospital, Virginia, on June 2d, 1864. He recovered, and was furloughed on August 9th, 1864. Surgeon H. D. Taliaferro, C. S. A., records the case.

CASE.—Private Adolphus Seymour, Co. F, 1st New York Cavalry, aged 21 years, received a simple fracture of the right side of the frontal bone, at New Market, Virginia, May 15th, 1864. He was transferred in June to Frederick, Maryland, and in October to Annapolis Junction, and thence to Satterlee Hospital, Philadelphia, and finally to Turner's Lane Hospital, whence he was discharged on March 16th, 1865, on account of confirmed epilepsy.

CASE.—Private Frederick Stapley, Co. E, 92d Illinois Volunteers, was admitted to Hospital No. 19, Nashville, Tennessee, on June 4th, 1863, on account of a simple fracture of the skull, according to the hospital register. If the diagnosis was correct, the case was unusually successful, since the patient returned to duty on June 18th, 1863. Surgeon John W. Foye, U. S. V., records the case.

CASE.—Private Frank Treber, Co. D, 10th Tennessee Volunteers, aged 38 years, was admitted to Hospital No. 19, Nashville, Tennessee, on March 21st, 1865, with a simple depressed fracture of the *os frontis.* He was transferred to Cumberland Hospital on April 20th, and returned to duty, well, on April 29th, 1865. Surgeon B. Cloak, U. S. V., records the case.

REMOVAL OF FRAGMENTS.—In the following cases of fracture of the skull, from falls or blows, depressed fragments of bone were removed by the forceps, saw, or elevator:

CASE.—Seaman Henry Black, of the United States Transport S. R. Spalding, fell from the spar deck into the hold, on June 20th, 1863, a distance of twenty-four feet, striking on the vertex of the skull. A large scalp wound, four inches in length with fracture of both tables of the skull, with depression, having a diameter of two inches, was produced. On his admission to the military hospital at Beaufort, North Carolina, the man was pale, his pulse imperceptible, and he lay groaning occasionally, his lower limbs moving spasmodically. The trephine was applied, but the depressed portion of bone could not be raised by the elevator. A portion of the fractured skull was then removed by Hey's saw; after which, the remaining portion was raised to its normal position by the elevator, and the periosteum, which had been carefully preserved, was brought back over the solution

of continuity of the bone. The wound was then dressed with cold water. The after treatment was of stimulant and tonic description, with careful attention to the bowels, and occasional opiates. At the date of the report, fifteen days after the operation, the patient was walking about the ward. The wound of the scalp was united and the small portion over the trephined part was healing by granulation. The case appears on the monthly report of Beaufort Hospital, North Carolina, signed by Surgeon F. S. Ainsworth, U. S. V.

Case.—Private Edward Connors, Co. A, 9th Illinois Cavalry, aged 22 years, received in a street fight, March 22d, 1864, a blow from a stone, which struck the left side of the forehead. He was admitted into the Lawson Hospital at St. Louis, Missouri, on the same day. There was an external wound three inches in length, a depressed fracture involving both tables of the skull. Several small spiculæ of bone were removed, and the depression of the inner table was raised by an elevator. A piece of the broken outer table was missing, having, apparently, been torn off at the time of the injury. A saline purgative was administered and low diet was prescribed, with cold water applications to his head. His general condition at this time was good; the pulse was natural, the pupils were sensible to light and normal in movement, and his intellect was perfectly clear. He continued thus until the night of the 23d, when symptoms of concussion and compression of the brain were manifested: the symptoms of compression, perhaps, predominating. On the following day, there was evidently compression, as indicated by the stertorous breathing and insensibility, dilated pupils and slow pulse. Death took place at midnight on March 24th, 1864. An autopsy was made on the following day. The external table of the frontal bone showed the loss of a fragment of the size of a quarter of a dollar. A fissure extended backwards an inch and a half into the left parietal. There was a stellate fracture of the inner table, but no depression. At the seat of injury there was no extravasation of blood. The brain substance around this point was softened, but to an inconsiderable degree. The specimen was preserved, but was not forwarded to the Army Medical Museum. The case was reported by Surgeon C. T. Alexander, U. S. A., in charge of Lawson Hospital.

Case.—Private Miles P. Hatch, Co. H, 161st New York Volunteers, aged 22 years, was admitted, on January 12th, 1865, to St. Louis Hospital, New Orleans, Louisiana, with twenty other wounded men, injured on the occasion of the collision between the United States transport J. H. Dickey, and John Rain, on the Mississippi River, fifteen miles below Vicksburg, on January 9th, 1865. Private Hatch was found to be still laboring under the effects of concussion of the brain. He had received a violent blow, causing a wound of the scalp and fracture of the skull. Symptoms of injury to the brain persisting, the wound in the scalp was enlarged, and the fracture was exposed, and a fragment of depressed bone was removed. The case terminated fatally on January 14th, 1865. This imperfect account is derived from the monthly report of the 161st New York Volunteers, for January, 1865, and from the hospital register, signed by Surgeon A. McMahon, U. S. V.

Case.—Private Jonathan Leet, Co. M, 22d Pennsylvania Cavalry, aged 18 years, received, on April 4th, 1865, a comminuted fracture of the cranium, by a blow from a glass bottle. He was admitted to hospital, at Cumberland, Maryland, on May 14th, from his regiment. Fragments of bone were removed on the following day. He was discharged from service on August 15th, 1865. Surgeon J. B. Lewis, U. S. V., records the case.

Case.—Private Conrad Murphy, Co. E, 17th Kentucky Volunteers, was confined for misconduct in the guard-house, on February 15th, 1863. He was insubordinate, and the sentinel struck him on the head with the butt of a musket, with such violence as to fracture the frontal bone. Murphy was taken to the Post Hospital, at Clarksville, Tennessee, under the charge of Surgeon A. B. Patterson, 102d Ohio Volunteers. Stertorous breathing, dilated pupils, oppressed pulse, and stupor, indicated compression of the brain. An incision was made at the seat of injury, and the depressed bone was elevated, and detached spiculæ were removed, but the grave symptoms were not modified, and death took place on February 18th, 1863. At the autopsy, made by Assistant Surgeon S. Hubbard, 17th Kentucky Volunteers, it was found that there had been an extensive extravasation of blood upon the brain.

Case.—Private ———, 149th New York Volunteers, received at Stevenson, Alabama, January 29th, 1864, a heavy blow from a glass bottle, in a private quarrel, in the camp of the Second Division, Twentieth Army Corps. He was taken to the regimental hospital, and Surgeon J. V. Kendall, 149th New York Volunteers, ascertained that there was a fracture of the frontal bone over the right frontal sinus, with depression of the vitreous table. The patient had repeated convulsions and in the intervals was partially comatose. Surgeon Kendall extended the wound in the integument so as to freely expose the bone, and removed four fragments of bone, and also raised a depressed portion of the inner plate, which was not detached. The scalp was then brought together by sutures, and cold water dressings were applied. The patient was reported as doing well in February, the symptoms of compression being entirely relieved, but it has been impracticable to learn the ultimate result of the case. The fragments of bone removed are represented in the adjoining wood-cut, (Fig. 20,) and comprise about half a square inch of the inner table, and a somewhat larger portion of the external table.

Fig. 20.—Four fragments removed from the right side of the frontal bone, fractured by a blow from a bottle; natural size. *Spec.* 2210, Sect. I, A. M. M.

Case.—Private Charles V. Orton, Co. L, 1st Tennessee Cavalry, in an engagement at Shoal Creek, Alabama, October 19th, 1864, received a wound in the neck from a musket ball, which lodged under the sterno-cleido-mastoid muscle, and also a blow, apparently from the butt of a musket, or stone, which produced a compound fracture of the frontal bone. The regimental surgeon, Dr. W. F. Green, reports that several fragments of bone were removed from the forehead, and the signs of compression of the brain being thereby relieved, the patient was sent, by way of Pulaski, to Nashville, Tennessee, and was admitted to Hospital No. 14, on November 23d. He was subsequently sent to the West End Hospital, at Cincinnati, Ohio, and was discharged from service, on May 2d, 1865, for disability rated at three-fourths. He was allowed a pension of six dollars per month from this date, and Commissioner H. Van Aernam states that he drew his pension on March 4th, 1869; but that the particulars of his condition at that time were not reported.

FIG. 21.—Segment of right parietal, showing a fracture from a blow from a spade.—*Spec.* 712, Sect. I, A. M. M.

CASE.—At Antietam, Maryland, September 17th, 1862, a soldier, employed in entrenching, struck another, on the left side of his head, with the edge of a spade. The wounded man fell, badly stunned, and, on examination, it was found that the blow had produced a depressed fracture of the left parietal bone. The patient was conveyed to the Smoketown Hospital, and was placed under the care of Surgeon B. A. Vanderkieft, U. S. V. He breathed with stertor, and had a slow pulse, dilated pupils, and the other signs of compression of the brain. The scalp was shaved, and an incision was made, through which a number of fragments of detached bone were removed. The patient lingered, in a state of stupor, until November 8th, 1862. The particulars of the case are not recorded in the register or in the reports from Smoketown Hospital; but the only death in the hospital from fracture of the cranium, at the date referred to, is that of Sergeant Arthur F. Hascall, Co. C, 61st New York Volunteers. The fracture extends downwards from the sagittal suture three inches, and it is an inch wide at its lowest part. A few fragments are adherent to the inner table, and the edges of the orifice are carious. The specimen is represented in the adjoining wood-cut, (FIG. 21.) The contour of the aperture in the bone represents, with exactness, the outline of the edge of the spade. The specimen was forwarded to the Army Medical Museum by Surgeon Vanderkieft, by Hospital Steward A. Schafhirt, U. S. A. The latter states that a detailed history accompanied the specimen. A careful search has failed to discover this paper, and the registers of the Museum contain no indication of its reception.

TREPHINING.—The following eighteen abstracts of cases of fracture of the skull from various causes, other than gunshot injury, refer to instances in which the trephine was formally applied:

CASE.—Private Joseph Burns, Co. C, 4th Kentucky Cavalry, aged 23 years, was struck on the head at 8 o'clock P. M., February 22d, 1864, by a slung shot, which produced a fracture of the skull, extending from the vertex to the left orbit, through the parietal, frontal, and the great wing of the sphenoid. The patient was taken to Clay Hospital, at Louisville, Kentucky, on the evening of the accident, with symptoms of grave compression of the brain. During the night he had frequent convulsions. Early the following morning, Acting Assistant Surgeon John E. Crowe applied the trephine, and elevated the depressed bone. The patient had previously been comatose or convulsed every five or ten minutes; but in ten minutes after the operation he became conscious, and spoke rationally, stating the circumstances attending his injury and his military history. In a few hours, however, the convulsive paroxysms returned, and continued during the night. The patient died on the succeeding day, February 24th, 1864. Surgeon Alexander T. Watson, U. S. V., records the case.

CASE.—Private Patrick H. Green, Co. H, 125th New York Volunteers, while on furlough, received a blow on the left side of the head from a slung shot, on the night of May 23d, 1863. He was treated by a private physician until June 3d, when he was admitted into the Ladies' Home Hospital, New York City. Twenty-four hours after his admission he had a spasm of the right side of the body, and, upon examination, there was found to be a depressed fracture of the skull. The scalp was laid open by an incision, and trephining was performed, and the depressed portions of bone were removed. The scalp wound was united by sutures, and a compress of cloths wet with tepid water were applied. Rest and quiet were enjoined. The convulsions ceased after the operation, and the wound discharged freely. The patient progressed favorably, and was discharged from service on September 21st, 1863, for hemiplegia. Acting Assistant Surgeon John W. Robie reports the case.

CASE.—Private Charles H———, Co. G, 61st Ohio Volunteers, aged 37 years, was found lying in the street, at Alexandria, Virginia, on September 27th, 1863, in a comatose condition, with a wound on the right side of his head. He was conveyed to the New Hallowell branch of the 3d Division General Hospital, by the provost guard. On admission his breathing was stertorous, laborious, slow; his pulse was at 48, full and regular. There was a punctured wound over the lower portion of the right parietal, and an examination by the probe showed that the bone was fractured and depressed. A crucial incision was made through the scalp, and the cranium being freely exposed, it was found that the fracture was much more extensive than had been supposed. A disk of bone was removed by the trephine, and several detached pieces were removed by the elevator, so that, altogether, a portion four inches in length by two inches in width of the skull-cap was taken away. The flaps of the integument were then brought together and were united by sutures. Cold water dressings were applied. The immediate effects of the operation were very remarkable. In less than three minutes after the removal of the depressed fragments, the patient opened his eyes, and appeared to awake to consciousness, and in less than a minute more he spoke, articulating distinctly. For the first week after the operation his diet was restricted to barley water. On October 4th, seven days after the operation, he was reported to have had no bad symptom and he complained of nothing but hunger. The sutures had been removed, and the greater portion of the incision had united by first intention. He was now allowed the "extra diet" of the hospital, consisting of oyster broth, rice pudding, and the like. On October 20th, the patient was up and about the ward. No untoward symptoms had intervened meanwhile, and the treatment had been unchanged. At this date the patient was put on "half diet," and the nearly cicatrized wound was dressed with simple cerate. He continued to do well until November 26th when he was visited by his brother, who brought him some bad news from home which disturbed him very much, and he immediately went to bed and became stupid and sullen, taking no notice of anything. Is it not possible that his brother brought

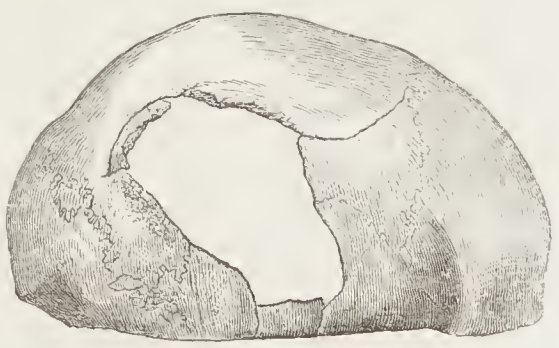

FIG. 22.—Section of cranium with great loss of substance from the removal of depressed fragments.—*Spec* 2673. Sect. I, A. M. M.

him some stimulant as well? On October 27th the patient had become comatose, with every sign of compression of the brain, and on October 28th, 1863, he died. At the autopsy, twenty hours after death, there was found to be an abscess in the right hemisphere and the neighboring brain substance was softened. The thoracic and abdominal viscera were healthy. The edges of the aperture were found to be rounded off and in process of repair. The notes from which the abstract is compiled were made by Acting Assistant Surgeon S. B. Ward, and the specimen was forwarded to the Army Medical Museum by Surgeon E. Bentley, U. S. V. It is represented in the wood-cut (FIG. 22) on the preceding page.

CASE.—Private *John T. Jenkins*, 5th Alabama Regiment, was received into a regimental hospital at Union Mills, Fluvanna county, Virginia, in October, 1861, suffering from compression of the brain, produced by a blow. The skull was extensively fractured. Trephining was unsuccessfully performed. The patient died on October 26th, 1861. The case is noted on a monthly report of sick and wounded signed by Surgeon A. Venable, C. S. A., and no further particulars can be obtained.

CASE.—Private William H. Lowery, Co. C, 6th Tennessee Cavalry, aged 22 years, was wounded in an affray at Memphis, Tennessee, October 3d, 1864, receiving a punctured fracture of the right parietal bone, near its superior posterior angle, produced by a blow of a musket, the hammer passing through both tables of the cranium. He remained in the regimental hospital until October 13th, when he entered Gayoso Hospital. He was somewhat drowsy and stupid, but no other symptoms of compression existed. On the following day he was put under the influence of chloroform, and Acting Assistant Surgeon Julius Brey trephined the skull and removed a circular portion of the outer table and three depressed fragments of the inner table. The tip of the little finger could be introduced through the opening made in the skull, and it appeared that there was no injury to the dura mater. Cold water dressings were applied to the wound. The patient was restless for several days, and slightly delirious at night. Symptoms of cerebral disturbance were thought to be favorably modified by the use of the extract of Cannabis Indica. On October 18th, an intercurrent attack of pneumonia supervened. On November 3d, there were signs of cerebral hernia. Protrusion of the cerebral substance progressed so rapidly, that on November 6th it was deemed expedient to compress the fungous mass by a bladder of ice. On November 7th, paralysis of the left arm was observed. On the 16th, the cerebral hernia was still further compressed by a metallic disk. Coma supervened, and the patient died, November 17th, 1864. Surgeon F. N. Burke, U. S. V., furnished the notes of the case.

CASE.—Private E. Miller, Co. G, 6th Virginia Cavalry, aged 17 years, was wounded, in a railroad collision on the Ohio and Mississippi Railroad, near Carlisle, Illinois, June 21st, 1865. He was taken to Illinoistown, under the care of his regimental surgeon, Dr. A. H. Thayer, and was thence sent to the Marine Hospital, St. Louis, Missouri, where a depressed fracture of the cranium was diagnosticated. Assistant Surgeon E. M. Horton, U. S. Army, decided that the symptoms of compression of the brain demanded an operation, and applied the trephine, and removed several fragments of bone; but the symptoms were not relieved, and the case terminated fatally in the night of June 23d, 1865. Surgeon T. F. Azpell, U. S. V., reports the case.

CASE.—Private Sumner H. Needham, Co. I, 6th Massachusetts Militia, on April 19th, 1861, during the attack upon his regiment, by riotous insurgents in Baltimore, Maryland, was struck on the forehead by a brick, which fractured the frontal bone. He was conveyed to the Baltimore University, where his wound was examined by Dr. William A. Hammond, who found symptoms of compression of the brain demanding the application of the trephine. The operation was immediately performed by Dr. Hammond, but the symptoms were not relieved, and the patient died in a few hours, April 19th, 1861. Mr. Needham, a resident of Lawrence, Massachusetts, was one of the earliest victims of the rebellion.*

CASE.—A negro, whose name was unknown, was brought into the E Street Infirmary, Washington, D. C., with well marked symptoms of compression of the brain, in the latter part of February, 1864. He was examined by Assistant Surgeon J. W. S. Gouley, U. S. A., who found a wound over the right parietal protuberance, caused apparently by a blow from the head of an axe. The scalp was shaved, and it was found that there was a depressed fracture of both tables of the skull, with detachment of a large fragment. It was not practicable to insert the elevator to raise the depressed fragment; to allow this to be done, a disk of bone was removed by the trephine. A triangular fragment, measuring an inch by one and a quarter inches, was then removed and the flaps of the scalp were approximated. The symptoms of compression were relieved, and the patient was doing well three days subsequently, when the specimen, represented in the adjacent wood-cut, (FIG. 23), was forwarded to the Army Medical Museum. The facts above noted are taken from a minute, made upon the reception of the specimen, by Surgeon John H. Brinton, U. S. V. It has been impracticable to learn the ultimate result of the case; but a letter from the late Assistant Surgeon T. G. Mackenzie, U. S. A., dated March 25th, 1864, states that the man was doing well at that date, though his left arm was paralyzed. Dr. Mackenzie refers to an escape of brain substance at the time of the injury; and Dr. Gouley, in forwarding this letter, states that at least half an ounce of brain matter was lost, and comments on the singular good fortune of the patient in recovering without the supervention of cerebral hernia, and without loss or apparent impairment of the mental faculties.

FIG. 23.—Disk and fragment of bone removed for depressed fracture from a blow.—*Spec.* 2081, Sect. I, A. M. M.

CASE.—A. B. Parish, Quartermaster's Department, received a lacerated wound of the frontal region, with fracture and depression of the frontal bone, by a kick from a horse, near Natchez, Mississippi, September 13th, 1864. He was admitted to the hospital, at Natchez, on the same day, in a semi-comatose condition. Soon after his admission, Acting Assistant Surgeon James S. King, administered chloroform, and trephined the skull, and raised the depressed portion of bone with the elevator. The patient soon reacted. Tonics, stimulants, and low diet, were ordered. The patient gradually improved, and was discharged from the hospital, entirely cured, on October 13, 1865.

* Record of the Massachusetts Volunteers, 1861-1865. Published by the Adjutant General, under a Resolve of the General Court. Quarto. Boston, 1868, pp. 793. Vol. I, p. 34.

Case.—Private P———, 14th Tennessee Confederate Infantry, aged 25 years, small in stature, but muscular, received, in a quarrel, a wound on the anterior portion of the parietal bone, from a stone held in the clenched fist of his adversary. He was stunned by the blow. Fearing punishment, he did not report at sick call for several days, when he was compelled to do so because of the supervention of erysipelas. He was soon relieved of this complication; but in a few weeks, became subject to epileptic paroxysms, which recurred every four or five days. He was discharged for disability, and went to his home, at Springfield, Tennessee. Convulsions recurred with such frequency and violence that he went to Nashville in May, 1862, to be treated by Dr. W. T. Briggs, of the medical school in that city. His general health was poor, the countenance pale, the bowels torpid, the pulse quick and irritable. A depression of the skull corresponded with the cicatrix of the original wound. There was no pain about the cicatrix; but a sense of pressure on the whole side of the head. After ten days of preparatory treatment, Dr. Briggs, assisted by Drs. Bowling and Buchanan, removed a disk of bone with the crown of a very large trephine. The inner surface of the disk presented a sharp angle at the union of the edges of the depressed inner table. Special instructions were given that the patient should rest quietly in bed, but he disregarded these instructions, yet the wound healed in ten days, and there was no recurrence of the convulsions. He reëntered the Confederate service, as a so-called "Partizan Ranger," and was captured and sentenced to be hung, but escaped before the sentence was executed; and, under these exciting circumstances had no return of epilepsy. The abstract of the case is compiled from a report by the operator.*

Case.—Private James Rogers, Battery L, 4th Ohio Artillery, was struck on the head by a stone on May 3d, 1865, receiving a depressed fracture of the skull. He was admitted to the hospital at New Creek, Virginia, on May 7th, in a comatose state. He remained in this condition until May 9th, when he was placed under the influence of ether, and Assistant Surgeon S. M. Finley, 22d Pennsylvania Cavalry, applied the trephine and elevated the depressed bone. The patient reacted well, and simple dressings were applied. Erysipelas supervened, but was successfully combatted by chloride of iron. The patient improved rapidly, the wound was cicatrized, and he returned to duty, well, on June 29th, 1865.

Case.—Private John R———, Co. H, 2d Michigan Volunteers, aged 41 years, was wounded on July 17th, 1865, in a street affray, receiving four wounds of the head from stones thrown at him. He was admitted to Armory Square Hospital, Washington, D. C., on the following day. He was perfectly conscious, yet had marked contraction of the pupils, with accelerated pulse, and a tremulous voice. There was considerable ecchymosis about the orbits. The first wound examined was over the frontal eminence, and penetrated no further than the aponeurosis of the occipito-frontalis muscle. The second was in the centre of the coronal suture, and slightly denuded the pericranium. The third was in the right temporal region, and likewise was a scalp wound. The fourth was on the right parietal eminence; and, upon a close examination, it was discovered that a minute depression of the bone, half an inch in diameter, existed, evidently produced by a blow from the sharp edge of the stone. The patient was a stout, muscular man, in good health; he suffered no nausea, and little pain. He was immediately placed under the influence of ether, and Surgeon D. W. Bliss, U. S. V., after shaving the scalp, made a crucial incision three inches in length, having the wound at the intersection of the incisions, and then, reflecting the flaps, applied the crown of a trephine and removed a disk of bone, which was found to include, with remarkable exactness, a depressed fragment of the vitreous plate. Between the diploe and depressed lamina there was a coagulum. The dura mater was uninjured The wound was partly closed by four sutures, an opening being left over the perforation, into which a pledget of charpie was inserted. The patient recovered favorably from the anæsthetic, and was put to bed and ordered to observe perfect quiet and strict diet. The case proceeded without an unfavorable symptom. On July 23d, the sutures were removed. On July 24th, the compress of charpie was taken away, and a healthy granulating surface appeared beneath. These facts in regard to the case were reported by Assistant Surgeon Charles A. Leale, U. S. V. The pathological specimen was presented to the Army Medical Museum by the operator, and is represented in Photograph No. 87 of the Surgical Section of the Army Medical Museum, and in the accompanying wood-cut, (Fig. 24.) The disk is seven-eighths of an inch in diameter, and is slightly reduced in the illustration. On August 24th, 1865, the patient was transferred to Harper Hospital at Detroit, Michigan. The case continued to progress favorably, and the man recovered without a bad symptom. He was discharged from service on September 8th, 1865.

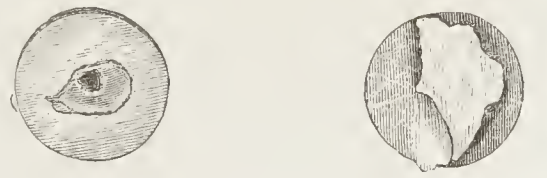

Fig. 24.—External and internal views of a button of bone removed for a depressed fracture by a blow from a stone.—*Spec.* 1452, Sect. I, A. M. M.

Case.—Private James C. Shedd, Co. D, 11th New York Cavalry, aged 19 years, was thrown from his horse to the pavement, while riding through the streets of New Orleans, Louisiana, April 10th, 1864. There was a compound comminuted fracture of the cranium, confined principally to the external table, which was depressed about an inch and a half in length and half an inch in depth. He was conveyed to the University Hospital, being in a stupid condition, in consequence of the concussion and the influence of liquor; but, at times, he was restless, and could be aroused for brief periods only by determined efforts. Shortly after admission he was placed under the influence of chloroform. Surgeon Samuel Kneeland, U. S. V., then enlarged the wound of the scalp, which was found much torn and bruised, and trephined the skull at the anterior portion of the right parietal region, removing several pieces of bone and elevating others. Cold water was applied to the wound, rest and quiet enjoined, and light diet ordered. The case progressed favorably, with very little cerebral disturbance, and on the 10th of June, 1864, the patient was discharged from the service, as a long time would be necessary for the exfoliation of the bone, extensively denuded of periosteum. His general health and strength were excellent.

Case.—Jesse Smith, Freedman, aged 18 years, employed as a cattle driver, rolled off, in his sleep, from the hay in a stable loft, and fell, some twelve feet to the floor, striking his head. He was found in the morning, cold and insensible, lying on the stable floor, near the horses. Under the use of frictions, hot drinks, and other restoratives he revived, and was carried to the Freedmen's Hospital, at Alexandria, Virginia. Acting Assistant Surgeon Robert N. Atwood, found a wound of the scalp of a crucial form over the right parietal eminence, and a depressed fracture of the bone; but, as the general condition of the

* The Nashville Journal of Medicine and Surgery, New Series, 1866, Vol. I, p. 35.

patient was comfortable, sensibility being restored, and the mental faculties being apparently normal, Dr. Atwood decided to await further developments. No decidedly bad cerebral symptoms appeared for twelve days after the injury, when the patient complained of increased headache, and a few hours subsequently had a severe convulsion. On the following day, the patient was much the same as usual, except that his headache was increased. Dr. Atwood, in consultation with Acting Assistant Surgeon A. W. K. Andrews, decided to operate, and ether having been administered, enlarged the original wound and applied the trephine, and removed a button of bone to which the greater portion of the depressed fragments were united by the inner table. On removing the bone, pus gushed out copiously. At the upper posterior part of the perforation the inner table was detached three-fourths of an inch more than the outer. This fragment was, with some difficulty, removed by strong forceps. An hour afterwards, the patient having recovered from the ether, was highly excited, restless, and complained of intolerable pain. He was ordered a grain of sulphate of morphia, and in two hours slept comfortably. For ten days subsequently, the morphia was continued, being given to the extent of two or three grains daily. His diet, at this time, was bread and milk, in small quantities, acidulated with vinegar, which he craved earnestly. He also had vinegar and water to drink. In three days after the operation the brain commenced to to protrude through the opening in the skull, and by the tenth day had attained the size and shape of half of a hen's egg. Dr. Atwood decided to try, by gentle compression, to reduce the protrusion, and applied a compress and retentive bandage with this view; but immediately violent convulsions occurred; and, although the compress was instantly removed, violent convulsive paroxysms recurred during the night, not less than fifteen or twenty times. The next day the patient was hovering between life and death, but he gradually rallied, and strange to say, after the subsidence of the convulsions he had no more pain in his head. His bowels had been regular throughout his illness, and he had taken no medicine except the morphia, which was discontinued as soon as the pain in the head ceased. Convalescence proceeded rapidly; the protrusion subsided; a firm and dense cicatrix covered the aperture in the skull; and the patient recovered without any impairment of his mental faculties or motor powers. Several months after his recovery he was brought to the Army Medical Museum to be photographed. The picture is numbered 185 in the Surgical Series. The boy was then in perfectly good health, and his faculties were unimpaired. The specimen of the disk and depressed fragment of the parietal was presented to the Museum by Dr. Atwood, and is figured in the accompanying wood cut, (FIG. 25.)

FIG. 25.—Disk and depressed fragment of bone from right parietal.—*Spec.* 4817, Sect. I, A. M. M.

CASE.—Private W. H. South, Co. H, 168th Pennsylvania Volunteers, while quartered in a house, at Washington, North Carolina, fell down stairs, May 13th, 1863, and struck upon the left side of his head. The medical officer of the garrison, Assistant Surgeon P. E. Hubon, 27th Massachusetts Volunteers, was summoned, and found that there was a stellated fracture of the cranium, one fissure running over the occipital bone, another fissure through the petrous portion of the left temporal, and a third extending to the left orbit. At the point of impact the left parietal was much depressed. The patient was unconscious, and stertorous breathing, dilated pupils, and other evidences of compression of the brain existed. Dr. Hubon applied the trephine and elevated the depressed bone. The patient did not regain consciousness, and died thirty-nine hours after the accident, May 15th, 1863. The case appears on the monthly report of the Post Hospital, Washington, North Carolina, for May, 1863.

CASE.—Private Charles E. Towns, Co. I, 9th New Hampshire Volunteers, was thrown from his horse, and falling upon his head, received a fracture of the cranium. He was treated in the regimental hospital until February 1st, 1865, when he was admitted to the hospital of the Second Division of the Ninth Army Corps. The accident is not recorded on the regimental reports, and it is impracticable to ascertain its date. Such facts as are known are derived from the report of the Corps Hospital. On the patient's admission it was decided that compression of the brain with depressed bone existed; and the operation of trephining was performed by Surgeon L. W. Bliss, 1st New York Volunteers. The date and other particulars are wanting. The patient died, February 20th, 1865. The case was reported by Surgeon F. N. Gibson, 9th New Hampshire Volunteers.

CASE.—Private Charles Williams, Co. B, 161st New York Volunteers, was admitted into St. Louis Hospital, New Orleans, Louisiana, January 12th, 1865, with an extensive fracture of the cranium and compression of the brain, caused by a blow received in a steamboat collision, January 9th, 1865, between the U. S. Transport J. H. Dickey and the Transport John Rain, on the Mississippi River, fifteen miles below Vicksburg. The trephine was applied and a portion of depressed bone was elevated, and another portion was removed. The patient died on January 18th, 1865. Surgeon A. McMahon, U. S. V., records the case on his monthly report without particulars of the operation or after treatment.

CASE.—Private Charles V———, Signal Corps, received, on February 24th, 1862, at Georgetown, D. C., a kick from a horse; the sharp cork of the shoe penetrating the cranium at the anterior inferior angle of the parietal bone, driving fragments of the internal table inward, penetrating the dura mater and rupturing the middle meningeal artery. He was seen by Acting Assistant Surgeon John S. Billings, six hours after the reception of the injury. He was comatose, and presented the usual signs of compression of the brain from depressed fracture. Dr. Billings applied the trephine and removed the depressed fragments, and also about two ounces of coagulated blood. The patient immediately came to his senses, and did well for four days, when symptoms of cerebro-meningitis set in. The patient was then transferred to the Union Hotel Hospital. Active treatment was unavailing, and death followed in two days, or on March 2d, 1862. The autopsy showed effusion of lymph over the whole of the right hemisphere of the cerebrum. A portion of the cranium, showing the extent of bone removed, was contributed, with a memorandum of the case, to the Army Medical Museum by Dr. Billings. It is represented in the adjacent wood cut, (FIG. 26.)

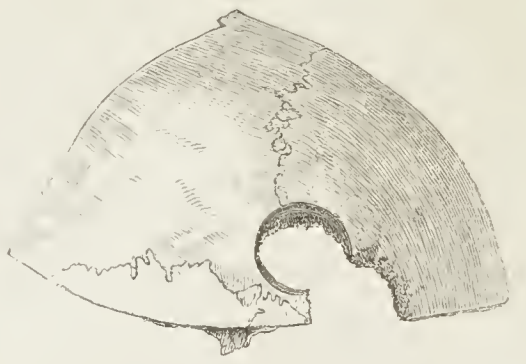

FIG. 26.—Section of the cranium trephined for depressed fracture from the kick of a horse.—*Spec.* 3453, Sect. I, A. M. M.

Five hundred and eight cases of injuries of the head, resulting from railroad accidents, falls, blows, or analogous causes, have been enumerated in the foregoing pages of this Section. They comprise nearly all of the cases of this nature reported by name during the war; all, in fact, in which the nature and seat of the injury could be satisfactorily verified. A large proportion pertain to the two latter years of the war, when the system of reporting had been perfected. A few cases, about eighteen altogether, have been gleaned from the Confederate records. Of the whole number of five hundred and eight cases, three hundred and thirty-one were contusions or lacerations of the integuments, without serious primary or secondary injury to the skull or its contents; seventy-two were examples of injury of the head affecting the brain, but without fracture of the skull; and one hundred and five were instances of fracture of the skull. In the first class, all of the patients recovered, though there were many instances of troublesome complications from hæmorrhage, abscesses under the scalp, erysipelas, and sloughing. In the second class, the percentage of complete recovery was small, as fourteen of the cases terminated fatally, and fifty-three patients were discharged for disability. In the third class, the mortality was large, fifty-seven of the one hundred and five patients having died.

Of the five hundred and eight cases, seventy resulted from railroad accidents, seventy-eight from falls, two hundred and six from blows, and one hundred and fifty-four from unspecified causes other than gunshot, the sabre, or the bayonet.

Analyzing the seventy cases of injuries by railway accidents, it is found that forty-nine were contusions and lacerations of the integuments, attended, in some instances, with the temporary effects of concussion, or by erysipelas, sloughing, or burrowing of pus. Thirty-five of these forty-nine men were returned to duty, and fourteen were discharged for disability. Eleven were cases of severe concussion, or contusion, or laceration of the brain, and of these patients, two were returned to duty, one was furloughed and not heard from afterwards, one was discharged as permanently blind, one died from pulmonary complications, and six died from the effects of the accident. Ten were cases of fracture of the skull, and, of these patients, one was returned to duty, one was transferred to the Veteran Reserve Corps, one was discharged, and seven, including one who had been unsuccessfully trephined, died. In short, of the seventy patients reported with injuries of the head from railroad accidents, thirty-nine went to duty, seventeen were discharged,* and fourteen died.

Of the seventy-eight cases of injuries of the head from falls, forty-three were examples of contusions or of contused or lacerated wounds, followed ultimately by recovery. Seventeen were attended by grave concussion of the brain, or other serious complications, and of these seventeen patients, three were returned to duty, nine were discharged, one was transferred to the Veteran Reserve Corps, one deserted, and three died. Eighteen were cases of fracture of the skull, and thirteen of them were fatal Five of the eighteen patients were subjected to trephining, or the removal of fragments, or the elevation of depressed bone, and three of the five recovered. In brief, forty-nine of the seventy-eight patients were returned to duty, twelve were discharged, sixteen died, and one was doing well at the last report, fifteen days after undergoing an operation for the elevation of depressed bone.

* In the summaries, the men transferred to modified duty in the Veteran Reserve Corps, are included with those returned to duty, and the furloughed men, not heard from, and the deserters, with those discharged.

Of the two hundred and six cases of injuries of the head from blows, the scalp alone was seriously involved in one hundred and eighteen; six of these patients deserted, and the remainder were returned to duty. Thirty-six cases were attended by cerebral complications; of these men, three went to duty, three to modified duty in the Veteran Reserve Corps, twenty-seven were discharged, and one died, while in two cases, the ultimate result has not been ascertained. Fifty-two were instances of fractures of the skull, and of this series of patients, seven recovered and were returned to duty, one was transferred to the Veteran Reserve Corps, fourteen were discharged for disability, twenty-eight died,* and in two cases the result is undetermined. Operative interference was employed in twenty of the fifty-two fractures. One of the patients went to duty, six were discharged, and eleven died, and in two cases† the ultimate issue has not been ascertained. The results of the two hundred and six cases may be thus recapitulated: one hundred and twenty-six went to duty, forty-seven were discharged, twenty-nine died, while in four cases the results are undetermined.

Of the one hundred and fifty-four cases of injuries of the head from unspecified causes, one hundred and twenty-one refer to uncomplicated contusions or lacerations of the scalp. One hundred and thirteen of these patients returned to duty, and eight deserted. In eight cases, the brain or its membranes were involved, and four of these patients were discharged on account of deafness, paralysis, or impairment of the mental faculties, one was transferred to the Veteran Reserve Corps, and three died. Twenty-five cases are reported as instances of fracture of the skull; but in several of the cases the diagnosis is not beyond suspicion. Six of these patients are reported as returned to duty, two were furloughed, eight were discharged for disability, and nine died.

In brief, of the five hundred and eight patients with wounds and injuries of the head, three hundred and thirty-four were returned to duty, ninety-eight were discharged, seventy-one died, and, in five cases, the results are undetermined.

The Contusions of the Scalp, from miscellaneous causes, may be conveniently subdivided into those in which there was laceration of small vessels in the areolar tissue and limited effusion of blood; those attended by extensive ecchymosis; and those in which the tissues were pulpified and disorganized.‡

The uncomplicated contusions of the scalp, without external breach of surface, that were treated in hospital, generally required but little surgical interference. They were commonly dressed with a spirit or lead lotion, at first, or by an ice bladder, or the frigorific mixture of hydrochlorate of ammonia, saltpetre, and salt, recommended by Hennen[1] and Schmucker,[2] conjoined with elevation of the head, and an antiphlogistic regimen. No instance of the application of leeches is mentioned. When a large amount of effused blood remained long unabsorbed, bandaging, with moderate compression, stimulating frictions, and general treatment were sometimes employed. In a few cases, the bad practice of incising the tumor and squeezing out the coagulum, is reported to have been adopted, with the result of inducing inflammatory action and unhealthy suppuration.

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* The case of Wiggins, on page 50, should have been recorded as fatal. He died on April 14th, 1865.

† Already referred to among the fifty-two fractures.

‡ Dupuytren, it is well known, classified contusions in four degrees, (*Leçons Orales*, T. IV, p. 267;) but even the French surgeons admit that either the third or fourth division is "*un peu arbitraire.*" See FOLLIN, *Traité de Pathologie Externe*, T. I, p. 386, Paris, 1869.

[1] HENNEN. *Principles of Military Surgery*, 3d ed., London, 1829, p. 283.

[2] SCHMUCKER, J. L. *Chirurgische Wahrnehmungen*. Berlin und Stettin, 1774, Erster Theil, S. 89.

In quite a large number of the contusions of the scalp, there was great extravasation of blood under the occipito-frontalis tendon; and, in several of these cases, suppuration ensued. They were judiciously treated by free incisions at the most depending parts, the courses of the larger arterial branches being avoided, and by the subsequent application of warm water dressings. Though complicated, in a few instances, by erysipelas and sloughing, recovery eventually resulted in all of these cases. There were also examples of bruises of the scalp, with effusion of blood in the meshes of the condensed cellular tissue connecting the common integument with the occipito-frontalis aponeurosis, producing that remarkable condition in which, the effused blood coagulating imperfectly, the portion in the centre remaining fluid, and the scalp being apparently depressed at this point, a depressed fracture is closely simulated. These circumscribed bosses, hard at the circumference and soft and depressible in the centre, were more frequently observed over the lateral regions of the skull. Fortunately, there were no symptoms of affection of the brain in these cases, and the attendants wisely refrained from cutting down upon the bone. Resolvent lotions and the popular plan of compressing the bump by one or two coins or a bit of folded sheet lead, appeared to expedite absorption. In two cases, the plan proposed by Champion,[1] of suddenly compressing the tumor by a blow severe enough to rupture the sanguineous cyst and to cause the blood to be infiltrated into the neighboring cellular tissue, was employed with good results. In these cases, a peculiar crepitation, due doubtless to broken fragments of fibrinous coagula, was observed.

There were a few instances in which the surface of the scalp was unbroken while the tissues composing it were crushed so as to be irretrievably disorganized. These cases were treated by warm emollient applications, until the gangrene that ensued had ceased, and the sloughs had separated, and granulation began; when the usual means of promoting cicatrization were employed.

The Contused and Lacerated Wounds of the Scalp will be so fully considered in the section on gunshot wounds of the head, that few comments will be required in this place. In examining the detailed histories of the several hundred cases barely enumerated in the foregoing part of this Section, examples are found of almost every variety of injuries of this nature, from slight solutions of continuity, resembling incised wounds, to nearly complete denudations of the calvarium. As a general rule, the treatment of these lesions appears to have been simple and judicious. That axiom of practical surgery which forbids, in the treatment of scalp wounds, the sacrifice of the smallest portion of damaged integument, was almost universally observed; and the means adopted of replacing and connecting detached flaps of integument were usually well selected. In several cases, very large portions of the scalp were described as nearly torn away, hanging by slender pieces of skin. Such injuries were caused, in two instances, by blows from muskets; but more frequently by falls, or by the passage of the wheels of heavy wagons, caissons, or gun-carriages, over the side of the head. In these cases, after suppressing hæmorrhage, on the rare occasions in which it was troublesome, after cleansing the pendulous flaps from the dirt, gravel, or other foreign bodies adhering to them, and after divesting them and the adjacent scalp of hair, it was customary to replace the flaps, and maintain them in position, either by agglutinative plasters, or by sutures. In most cases, the dressing was completed by the application of compresses dipped in cold water, and maintained by a

[1] *Archives Générales de Médecine*, Première Série, 1827, T. XV, p. 139.

bandage. In some instances, layers of raw cotton, charpie, or picked oakum, were arranged as graduated compresses upon the flaps. A few surgeons preferred to apply poultices or warm water dressings, if the scalp was much mangled. In all of the cases of detachment of large flaps, it would appear that the pericranium was fortunately left entire; and, though many of these cases were complicated by erysipelas, sloughing, or by the bagging of pus, the wounds granulated after awhile, and all eventually cicatrized. No instance was reported of any special inconvenience arising from the employment of stitches. In one case, a very long wound was sewed up by the continued or Glover's suture, without bad consequences. Usually, when adhesive plasters were considered insufficient to approximate the edges of the wounds, the interrupted suture with metallic threads was employed. Assistant Surgeon J. S. Billings, U. S. A., reports a lacerated wound of the scalp neatly approximated by tying together the hairs bordering the retracted edges of the wound. This expedient answered a good purpose, cicatrization following as promptly as usual under more methodical dressings.

In scalp wounds with little separation of the edges, adhesive plasters were the ordinary dressing. The importance of adjusting the parts with the nicest accuracy, and of leaving sufficient intervals between the strips, with the lower angles of the wound open, was generally appreciated. The propriety of removing the dressings as infrequently as practicable was commonly recognized. In the hospitals about Philadelphia, the gauze and collodion dressing recommended by Dr. P. B. Goddard, found favor; but the isinglass and resin plasters, supplied by the field medicine-chests and knapsacks, were the agglutinatives commonly employed. In a few cases, it is stated that the old fashioned Friar's Balsam* was advantageously employed.

The complications arising in this class of wounds of the scalp were hæmorrhage, erysipelas, abscess, and sloughing. Several instances of troublesome bleeding from the posterior auricular, occipital, or temporal arteries, or their branches, are reported; but, in every case, the hæmorrhage was controlled by compression, either by the clamp tourniquet, or the common tourniquet, or by a circular bandage and compress, or by a compress consisting of a metallic disk. In one case, a profuse secondary bleeding from the temporal was arrested by dividing the vessel transversely, and suffering it to retract. Persulphate of iron, in powder or solution, was employed as a styptic in several cases; but not with advantage. In a case in which it appeared that ligation must be resorted to, acupressure was suggested as peculiarly appropriate; and preparations to use this resource were made, when, the bleeding being controlled by pressure, ceased, and did not recur. Erysipelas was not a very frequent complication, being reported in but thirteen of the four hundred and three cases unattended by fracture. Nearly all of the cases in which it supervened were attended by symptoms of affection of the membranes of the brain, or of the brain itself; yet, with one exception, (KIRKLAND, p. 53), they terminated favorably, under the supporting and stimulating treatment uniformly adopted. There were numerous instances of abscesses under the scalp, due apparently, in most cases, to negligence in keeping the detached scalp in apposition with the subjacent parts by gentle bandaging, or to the retention of clots of blood under the flaps. Incisions, followed by fomentations and poultices, and the washing out of the cavity of the abscess by warm detergent solutions, appears to have been the ordinary treatment In many of the contused and lacerated

* Compound Tincture of Benzoin, or *Baume du Commandeur*, or *Teinture balsamique* of the French Codex.

wounds, there was slight loss of tissue from gangrene, and in two cases, very large portions of the scalp sloughed away, yet the exposed surface was soon covered with florid granulations, and rapidly cicatrized. Detergent or stimulating lotions were employed in these cases, and solutions of the salts of zinc or the permanganate of potassa were the applications commonly selected.

Concussion of the Brain.—It will be remembered that the five hundred and eight cases of injuries of the head from miscellaneous causes were classified, on page 61, in three divisions: the first comprising three hundred and thirty-one cases of injuries of the integuments chiefly; the second, seventy-two cases of severer injuries, with cerebral complications; and the third, one hundred and five cases of fractures of the skull. In the second class were placed only those cases which terminated fatally, or in discharge for disability, or in return to modified duty after protracted disability. But concussion of the brain, temporary in its effects, was observed in a large proportion of the three hundred and thirty-one slighter cases enumerated in the first class; and, in fifteen of them, this complication was attended by profound insensibility and collapse and appeared, at first, to be very serious, though speedily followed by reaction and recovery. Severe commotion or concussion of the brain was observed in fifty-nine of the seventy-two cases of the second class, or, altogether, in seventy-four of the four hundred and three cases of miscellaneous injuries of the head without fracture. The treatment of this condition usually consisted in wrapping the patient in hot blankets, and applying bottles of hot water to the extremities, in employing frictions, and sinapisms, and stimulating enemata; and, after reaction was established, in prescribing purgatives, low diet, and rest in bed. The precautions suggested by authors respecting the use of volatile salts, cordials, and venesection during the stage of collapse, appear to have been observed uniformly. The management of the stage of reaction appears, also, as a general rule, to have been prudent and judicious; but many exceptions, due sometimes to the exigencies of the situation, and sometimes to the negligence or officiousness of the attendants, are noticed, in which quiet and abstinence were not enjoined, or stimulants and full diet were ordered in obedience to false therapeutic dogmas in preference to the lessons of experience. To these causes, probably, must be attributed the considerable number of instances in which concussion was followed by cerebral irritation or encephalitis, complications which will be considered further on. In one case of concussion, (SHERMAN, p. 41,) when reaction was becoming over-action, venesection was practiced, with apparent advantage. In one case, concussion produced almost instant death, (TURNER, p. 44;) but neither this nor the thirteen other cases which resulted fatally from the direct effects of concussion, throw any light upon the functional or textural alterations of the brain resulting from this shock, but leave the subject, which has perplexed pathologists for so many centuries, as inscrutable as ever

As has been intimated at the beginning of this Section, the value of the numerical statistics relative to concussion and compression of the brain derivable from "monthly reports of sick and wounded," would have been greater, if the cases due to miscellaneous causes had always been separated from those resulting from injuries by gunshot projectiles. In the first year, and in a portion of the second year, of the war, the reporters failed sometimes to make this important discrimination; but, subsequently, explicit instructions having

been promulgated, the gunshot injuries were separately reported. The number of cases of concussion and compression of the brain recorded on the monthly reports is given in the following table:*

Table I.

Cases of Concussion or Compression of the Brain, generally from Causes other than Gunshot, recorded on the Monthly Reports during the War.

Year.	May and June, 1861.		Year ending June 30, 1862.		Year ending June 30, 1863.		Year ending June 30, 1864.		Year ending June 30, 1865.		Aggregate.	
White Troops.												
Mean strength in Field and Garrison..	41,556		279,590		630,761		622,058		574,022		515,517	
" " " General Hospitals..	.....	.....	9,548		45,630		55,710		71,481		45,593	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Concussion of Brain.....	7	.....	144	19	295	62	234	52	193	60	873	193
Compression of Brain.....	1	.....	60	17	.....	.....	.....	.....	.....	.....	61	17
Colored Troops.												
Mean strength in Field and Garrison..	.....	.....	.....	.....	.....	.....	46,020		86,660		66,340	
" " " General Hospitals..	.....	.....	.....	.....	.....	.....	1,222		5,572		3,397	
							Cases.	Deaths.	Cases.	Deaths	Cases.	Deaths.
Concussion of Brain.....	.....	.....	.....	.....	.....	.....	18	9	31		49	22

This table indicates that in the year ending June 30th, 1862, there was one case of concussion of the brain in a mean strength of 2,008, and that of 144 cases, one in 7.5 was fatal. In the following year, when the concussions from gunshot injury may be supposed to have been generally excluded, there was one case of concussion in a mean strength of 2,292, and a mortality of one in 4.7 cases. In the third complete year there was, among the white troops, one case of concussion in 2,896, and a mortality of one in 4.5; and, in the colored troops, one case of concussion in 2,625 cases, with a mortality of one in 2 cases. In the fourth year, the cases of concussion were, among the white troops, one in 3,344 mean strength, with a mortality of one in 3.2, and, among the colored troops, one in 2,975 mean strength, with a mortality of one in 2.4.

The report of Surgeon Thomas H. Williams, C. S. A., Medical Director of the Confederate Army of Northern Virginia, shows that the consolidation of the monthly reports of sick and wounded for nine months, from July, 1861, to March, 1862, inclusive, furnish eighteen instances of concussion of the brain in a mean strength of 49,394. During the

* The consolidations for white troops are taken from page 640 of the medical volume of the First Part of the Medical and Surgical History of the Rebellion. The consolidations for the colored troops are furnished me in manuscript by Brevet Lieut. Col. J. J. Woodward, Assistant Surgeon U. S. A. After 1862, "compression of the brain" was excluded from the nomenclature of the monthly report of sick and wounded. The deaths are understood to be included among the cases: *e. g.* of 144 patients with concussion of the brain, during the year ending June 30, 1862, 19 died.

months of September, October, November, and December, 1862, of an aggregate of 48,543 patients in the General Hospitals under the supervision of Surgeon T. H. Williams, C. S. A., there were sixteen examples of concussion of the brain. All of these thirty-four cases terminated favorably. From the absence, in these reports, of any fatal results from concussion, it may be inferred such were probably entered under other headings. Of the Confederate systematic writers on military surgery, the compilers of the official manual[1] advise, in the early treatment of concussion, the use of external warmth, frictions, and diffusible stimuli; Surgeon J. J. Chisolm[2], C. S. A., thinks "the safest practice consists in doing as little as possible, the indiscriminate use of stimuli on the one hand, or bloodletting on the other, being especially avoided;" while the Surgeon General of North Carolina, E. Warren,[3] with strange confusion, "in order that the pathological difference between concussion and compression of the brain may be thoroughly comprehended," ascribes to concussion the signs almost universally believed to attend compression. The "Confederate States Medical and Surgical Journal," published under the auspices of Surgeon General S. P. Moore, C. S. A., contains no reference to the treatment of concussion of the brain, and the reports and treatises above alluded to furnish the scanty information to be derived from the Confederate records.

Fractures of the Skull.—Of the one hundred and five cases of fracture of the skull recorded in this Section, forty-six were instances of simple and forty-three of compound fracture; while, in sixteen cases, the reports are silent regarding this distinction. Fifty-seven of the one hundred and five cases terminated fatally; in three cases, the ultimate results cannot be learned; and forty-five patients are reported as recoveries. The causes of death in the fifty-seven fatal cases were: compression of the brain from fragments of bone, in sixteen cases; laceration of the brain, in five cases[4]; shock and concussion, in two cases; extravasation of blood, in sixteen cases; encephalitis, in ten cases; abscess of the brain, in six cases; epilepsy, in one case; cerebral hernia, in one case. Each of the three undetermined cases was doing well several weeks after the reception of the injury. Of the forty-five patients reported as returned to duty, thirty had simple and fifteen compound fractures, and four of the simple and seven of the compound fractures were depressed. Of these forty-five patients, seventeen recovered wholly, and were returned to duty; one recovered and was mustered out on the expiration of his term of service; another recovered from the injury of the head, and was discharged on account of the loss of an arm; and twenty-six were discharged on account of physical disabilities of various degrees Epilepsy, in three cases; hemiplegia or paraplegia, in three cases; impaired intellectual functions, in two cases; deafness, in two cases; imperfect vision, in one case; vertigo and cephalalgia on exposure to the sun, in five cases, are the disabilities particularly specified. It is safe to say, that nineteen of the one hundred and five patients with fractured skull recovered completely, that twenty-nine recovered partially, and that fifty-seven died.

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[1] *A Manual of Military Surgery, prepared for the Use of the Confederate States Army, by Order of the Surgeon General.* Richmond, 1863, p. 7.

[2] Chisolm. *A Manual of Military Surgery for the Use of Surgeons of the Confederate States Army.* Columbia, S. C., 1864, p. 275.

[3] Warren. *An Epitome of Practical Surgery for Field and Hospital.* Richmond, 1863, p. 351.

[4] In one of the cases of laceration of the brain (Michael B——, p. 44) there was cerebral hernia, as well as in the case of Lowery (p. 58), cited two lines further on. In the latter, this complication was apparently, the proximate cause of death.

All of the cases, twenty-eight in number, of fracture of the skull without injury to the brain or its membranes terminated favorably, with the exception of the case of Private M. Young (p. 39), complicated by a terrible laceration of the testes. Fifty-eight cases in which symptoms of compression of the brain supervened immediately or soon after the reception of the injury, present forty-six deaths, three instances of favorable progress a few weeks after the injury with the ultimate results undetermined, and three examples of complete, and six of partial recovery. In the nineteen remaining cases cerebral complications appeared at a later date:[1] ten of the nineteen were fatal; eight ended in permanent disabilities, through impairment of the mental, sensory, or motor functions; while only one patient completely recovered.

It was observed that fissures or long linear fractures with little depression, as a general rule characterized the fractures of the skull from falls or railroad accidents, while extensive splintering of the internal table was a very frequent consequence of blows from blunt weapons.

The portion of the cranium injured is referred to in seventy-eight of the reports, and is indicated in the following tabular statement:

TABLE II.

Seat of Injury in One Hundred and Five Fractures of the Skull from Falls, Blows, &c.

REGIONS.	Cases.	Died.	Disch'd.	Duty.	Unkn'n.	Per cent. of deaths.
Frontal	22	10	6	5	1	47.6
Parietal	33	15	12	4	2	48.4
Temporal	7	6	1	.....	.....	85.7
Occipital	2	2	.....	.....	.....	100.
Base	11	11	.....	.....	.....	100.
Frontal and Parietal	1	.....	.....	1	.....	
Frontal, Parietal, and Sphenoid	1	1	.....	.....	.....	100.
Temporal and Parietal	1	1	.....	.....	.....	100.
Not stated	27	11	9	7	.....	40.7
TOTAL	105	57	28	17	3	55.8

The far greater fatality of fractures of the side and base of the cranium than of those implicating the anterior and upper portions of the vault, is well illustrated by these figures.

There were no instances of fracture of the internal table alone; but the case of Cahill (p. 54), and that of Sharp (p. 55), afford, perhaps, illustrations of fracture implicating the external table only, over the frontal sinus and at the base of the zygoma. The case of Schneider (p. 41) also, reported among the severe contusions, the patient having been discharged on account of obstinate ozæna from ulceration of the frontal sinus, possibly belongs to the category of fractures of the external table The frequency of such frac-

[1] *At incipere febrem in capitis vulnere, quarta die aut septima aut undecima, valde lethale est.* HIPPOCRATES, *De Prædict.* Lib. II, Sect. II. Cap. 10.

tures has been overestimated by Sir Astley Cooper[1] and other eminent surgical writers. In rare instances, blows upon the mastoid or zygomatic processes, or frontal sinuses, produce such an injury; but, over the vault of the cranium, a depression of the outer table upon the diploe, without lesion of the vitreous lamina, is oftener described in books than demonstrated by pathological preparations.[2]

Of the eleven cases of fracture of the base of the cranium, two were accompanied by that peculiar colorless discharge from the auditory canal which excited so much discussion among surgeons thirty years ago, and which is held to be a positive indication of fissure of the petrous bone.[3] Three cases of fracture of the base were believed to be instances of fracture by *contre-coup*. This subject will be fully considered hereafter, and it will be shown that the existence of such fractures, in the sense understood by Grima[4] and Saucerotte, may be fairly called in question.

In seventy-nine cases of fracture of the skull treated without operative interference, the death-rate was 54.4. Of twenty-six cases operated upon, the ultimate results are ascertained in twenty-three, in which the mortality-rate was 60.8.

Removal of Fragments and Trephining.—Of the twenty-six depressed fractures treated by the removal of fragments and trephining, five were caused by falls, three by railroad or steamboat accidents, and eighteen by blows. Fourteen of the patients died. Three undetermined cases were progressing favorably fifteen days, three weeks, and four weeks, respectively, from the date of injury. Nine patients recovered, of whom two went to duty, two were discharged though entirely well, and five were discharged for disabilities due to cerebral disorders. In brief, it may be said of the twenty-six cases in which operative interference was employed, that complete recovery took place in four cases, partial recovery in eight cases, and death in fourteen cases.

The cases recorded in this Section afford instances of commotion, contusion, laceration, and compression of the brain, of rupture of the meningeal arteries, of cerebral irritation, of perversion or loss of the sensory or intellectual functions, of various paralyses, of puffy tumor and persistent pain in the scalp; but general observations on these subjects, all of which will appear again in the succeeding Section, may be reserved for the conclusion of this Chapter.

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[1] ASTLEY COOPER. *Lectures on Surgery*, London, 1842, p. 130.

[2] Specimen 4853, Section I, A. M. M., represents a segment of the frontal bone of a young man who received a blow from a fireman's iron "spanner" upon the left superciliary ridge. Such competent observers as Drs. Thomas Miller and Robert King Stone, of Washington, diagnosticated a depression of the outer table of the frontal sinus. Several months subsequently, the patient died from inflammation of the brain, and an extensive depression of the inner table was revealed. The large collection of specimens of fractures of the skull in the Army Medical Museum fails to afford a single example of fracture of the outer table singly, if the groovings by shell fragments and incisions by cutting weapons are excluded.

[3] Berengarius, in his work on Fractures of the Cranium, published at Bologna, in 1518, first called attention to this phenomenon, and Stalpart Van der Weil, (*Obs. rarior. cent. prima*, Obs. XV, Leyden, 1728, p. 68.) cited an example, and quoted another from Langelot; but Laugier, in his note to the French Institute, in 1839, pointed out the significance of this discharge in diagnosis.

[4] GRIMA, *Sur Les Contre-coups dans les Lésions de la Tête.* Mémoires sur les Sujets proposés pour les Prix de l'Académie Royale de Chirurgie. Paris, 1819, T. IV, p. 207; SAUCEROTTE, in the same work, Vol. IV, p. 290. SABOURAUT, *loc cit.*, p. 337, and many others.

Section III.

GUNSHOT WOUNDS.

In modern times, the proportion of wounds and injuries of the head received in action has always been large. In the late war, the ratio of such injuries to the total number of casualties was especially great, because the men frequently fought under cover, and many of the engagements were of the nature of siege operations. More than twelve thousand gunshot wounds of the head must be discussed. They will be classified, with many subdivisions, into those affecting the scalp only, those attended with injury to the skull, and those implicating the encephalon.

Gunshot Wounds of the Scalp.—The number of such cases is so great that it is only practicable to present a numerical statement, supplemented by details of the fatal and complicated cases.

Table III.

Results of Seven Thousand Seven Hundred and Thirty-nine Cases of Gunshot Wounds of the Scalp reported during the War of the Rebellion.

Patients.	Died.	Duty.	V. R. C.	Resigned.	Dismissed.*	Leave of absence.	Discharged.	Furloughed.	Deserted.	Transferred to Gen'l Hospital.	Paroled.	Exchanged.	Released on oath.	Unknown.	Total.
U. S. Officers	11	167	.....	10	10	97	35	.....	.....	.....	.....	.....	.....	7	337
U. S. Enlisted Men (white)	126	3108	127	.....	.....	.....	542	76	261	1427	.....	.....	.....	958	6625
U. S. Enlisted Men (colored)	7	75	.....	.....	.....	.....	13	2	4	26	.....	.....	.....	11	138
Citizen Employés, U. S.	1	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	10
Confederate Officers	.....	1	.....	.....	.....	.....	.....	5	*3	.....	2	6	.....	8	25
Confederate Enlisted Men	17	65	.....	.....	.....	.....	3	118	7	156	6	108	10	114	604
Total	162	3420	127	10	10	97	593	201	275	1609	8	114	10	1103	7739

* The inference from the records is that these ten officers were not dismissed dishonorably, but were stricken from the rolls for failing to comply with orders to report their condition while on leave of absence.

The following fifty-four fatal cases of gunshot wounds of the scalp are reported as uncomplicated. In every instance, the most careful scrutiny has been exercised to determine if any injury of the cranium, or its contents, was suspected by the surgical attendants:

CASE.—Private Thomas Armstrong, Co. D, 2d Maryland Volunteers, aged 48 years, received a flesh wound of the head, in an engagement before Petersburg, Virginia, July 2, 1864, from a conoidal ball. He was at once admitted to the Hospital of the Second Division, Ninth Corps, thence sent to City Point, and conveyed to the DeCamp Hospital at David's Island, New York, where he arrived on July 6th. He died on the 14th of July, 1864.

CASE.—Private James Barry, Co. D, 2d New York Mounted Rifles, aged 30 years, received, in an engagement before Petersburg, Virginia, June 18, 1864, gunshot flesh wounds of the head and arm. He was admitted to the hospital of the Second Division, Eighteenth Corps, and, on June 19th, was sent to the First Division Hospital at Annapolis, Maryland, where he died, June 22d, 1864. The late Surgeon B. A. Vanderkieft, U. S. V., recorded the case.

CASE.—Sergeant Harvey F. Beals, Co. C, 59th New York Volunteers, was struck, at the battle of Cold Harbor, Virginia, June 3d. 1864, by a fragment of shell, which caused a flesh wound of the head. He was admitted, on June 8th, to the Columbian Hospital, Washington, D. C., where simple dressings were applied. Death occurred on June 12th, 1864.

CASE.—Private Horace Bellows, Co. G, 98th New York Volunteers, aged 34 years, was wounded, in an engagement at Chapin's Farm, Virginia, September 19th, 1864, by a conoidal ball, which severely injured the scalp over the right side of head. He was admitted to the hospital of the First Division, Eighteenth Corps. On October 2d, he was transferred to the hospital at Fort Monroe, Virginia, and on October 15th, to the White Hall Hospital, near Bristol, Pennsylvania. He died on October 20th, 1864. Assistant Surgeon W. H. Forwood, U. S. A., reported the case.

CASE.—Private Rupert Carney, Co C, 28th Pennsylvania Volunteers, aged 38 years, received, in an engagement near Dallas, Georgia, May 25th, 1864, a slight gunshot scalp wound of the back of the head. He was admitted to the hospital of the Second Division, Twentieth Corps, and, on June 2d, was transferred to the hospital at Chattanooga; thence, on June 11th, to Hospital No. 1, Nashville, Tennessee, where he died, on June 15th, 1864, from the effects of the wound.

CASE.—Corporal Wm. G. Carr, Co. G, 13th New Hampshire Volunteers, aged 40 years, received, in a skirmish, on May 13th, 1864, a wound of the scalp, from a fragment of shell striking over the left eye, and making a ragged wound an inch and a half in length. He was sent to the hospital at Point Lookout, Maryland, and died on June 22d, 1864.

CASE.—Private Frank Carter, Co. F, 17th New York Volunteers, aged 18 years, was wounded, in an engagement before Petersburg, Virginia, June 17th, 1864, by a fragment of shell, which cut the scalp near the vertex. He was, on the same day, admitted to the hospital of the Second Division, Ninth Corps, and, on June 19th, sent to the Hospital at Annapolis. The wound was dressed with dry lint, sprinkled with opium. The patient died July 7th, 1864.

CASE.—Lieutenant John R. Clemm, Co. K, 3d Maryland Volunteers, received, at the battle of Chancellorsville, Virginia, May 3d, 1863, a slight gunshot flesh wound of the head. He was admitted to the field hospital of the First Division, Twelfth Corps. He died on May 22d, 1863. Surgeon A. Chapel, U. S. V., recorded the case.

CASE.—Private Jackson Clifton, Co. D, 107th Illinois Volunteers, aged 22 years, received, at the battle of Franklin, Tennessee, November 29th, 1864, a shell wound of the right side of the scalp. He was admitted, on December 1st, to Hospital No. 3, Nashville, Tennessee, where simple dressings were applied. On December 2d, he was transferred to the Jefferson Hospital, Jeffersonville, Indiana, where he died, on December 17th, 1864, from the "effects of wound."

CASE.—Private William Coakley, Co. K, 28th Massachusetts Volunteers, aged 40 years, received, in an engagement before Petersburg, Virginia, June 16th, 1864, a lacerated wound of the scalp from a fragment of shell. He was admitted to the hospital of the First Division, Second Corps, and thence sent to the First Division Hospital at Annapolis, Maryland, which he entered on June 20th. Simple dressings were applied to the wound. The patient died on June 28th, 1864.

CASE.—Private Stephen Colledge, Co. E, 2d Pennsylvania Artillery, aged 33 years, received, in an engagement before Petersburg, Virginia, June 18th, 1864, a gunshot wound of the right side of the scalp. He was, on the next day, admitted to the hospital of the Eighteenth Corps, and on June 21st, was sent to the Chesapeake Hospital, near Fort Monroe, where he died on July 17th, 1864. Assistant Surgeon E. McClellan, U. S. A., records the case.

CASE.—Private Martin Cornell, Co. N, 7th Rhode Island Volunteers, aged 33 years, received, at the battle of Spottsylvania Court House, Virginia, May 12th, 1864, a gunshot wound of the integuments of the forehead, over the right eye. He was, at once, admitted to the hospital of the Second Division, Ninth Corps. On May 16th, he was sent to the Harewood Hospital, Washington, D. C., and, on May 18th, was transferred to the First Division Hospital, Annapolis, Maryland, where he died, on June 1st, 1864 The late Surgeon B. A. Vanderkieft, U. S. V., recorded the case.

CASE.—Private Albert L. Curtis, Co. D, 17th Maine Volunteers, aged 20 years, was struck, near Petersburg, Virginia, June 17th, 1864, by a fragment of shell, which caused a flesh wound of the head. He was admitted to the hospital of the Third Division, Second Corps, and thence, on the 21st, conveyed to Washington, D. C., to the Lincoln Hospital. On the 27th, he was sent to Cony Hospital, at Augusta, Maine. Death occurred on August 12th, 1864. Surgeon G. Derby, U. S. V., reported the case.

CASE.—Private Van Buren Danner, Co. H, 87th Pennsylvania Volunteers, aged 26 years, was struck, at the battle of Winchester, Virginia, September 19th, 1864, by a conoidal ball, which produced a lacerated wound of the scalp over the left

frontal eminence. He was admitted to the depot field hospital on the same day. On the 25th, he was sent to the hospital at Sandy Hook, Maryland, and on the 26th, he was transferred to the Sixteenth and Filbert Streets Hospital, Philadelphia. He died on November 10th, 1864. Surgeon T. B. Reed, U. S. V., reported the case.

CASE.—Private John Duett, Co. E, 8th Maine Volunteers, aged 26 years, received in an engagement at Drury's Bluff, Virginia, May 16th, 1864, a wound of the scalp in the occipital region from a grape shot. He was, on May 18th, admitted to the hospital at Point Lookout, Maryland, where he died on July 4th, 1864. Surgeon A. Heger, U. S. A., recorded the case.

CASE.—Eben L. Farrar, Musician, Co. I, 96th New York Volunteers, aged 19 years, was wounded in an engagement before Petersburg, Virginia, June 23d, 1864, by a conoidal ball, which tore the scalp over the parietal bone. He was at once admitted to the field hospital of the Eighteenth Corps, and, on June 25th, transferred to the Hampton Hospital, Fortress Monroe. Simple dressings were applied to the wound. He died on July 4th, 1864, from the "effects of the scalp wound."

CASE.—Private William Finke, Co. I, 13th Indiana Volunteers, aged 25 years, was wounded in an engagement near Bermuda Hundred, Virginia, on May 20th, 1864, by a conoidal ball, which tore the scalp. He was admitted to the hospital of the First Division, Tenth Corps; on May 21st, he was sent to the hospital at Fort Monroe, and on June 1st, 1864, transferred to the Ward Hospital, Newark, New Jersey, where he died on June 15th, 1864. The late Surgeon G. Taylor, U. S. A., recorded the case.

CASE.—Private Leroy W. Freeman, Co. H, 142d Pennsylvania Volunteers, aged 18 years, was wounded in an engagement at the South Side Railroad, October 27th, 1864, by a conoidal ball, which struck over the right parietal bone. He was, on October 29th, admitted to the hospital steamer Connecticut, and conveyed to Washington, D. C., where he entered the Emory Hospital on October 30th. Simple dressings were applied to the wound. Death occurred on November 12th, 1864, "from hectic fever." Surgeon N. R. Mosely, U. S. V., reported the case.

CASE.—Private *L. Garrett*, Co. C, 56th Alabama Regiment, was admitted to the prison hospital at Nashville, Tennessee, with a gunshot wound of the scalp. He died on November 5th, 1863. Acting Assistant Surgeon T. G. Hickman reported the case.

CASE.—Private W. A. Giles, Co. C, 98th Ohio Volunteers, received near Atlanta, Georgia, August 6th, 1864, a gunshot wound of the scalp, and was sent to the hospital of the Second Division of the Fourteenth Corps. He was transferred, on August 24th, to Chattanooga, Tennessee, and died, at Hospital No. 1, on August 29th, 1864.

CASE.—Private George Graff, Co. E, 32d Indiana Volunteers, was struck by a conoidal musket ball, near Dallas, Georgia, May 26th, 1864, and was received at Chattanooga, Tennessee, on June 3d, with a severe lacerated wound of the scalp. He died June 5th, 1864. Surgeon E. B. Collins, 51st Indiana Volunteers, records the case.

CASE.—Private George Hall, Co. D, 30th United States Colored Troops, aged 20 years, received, in an engagement before Petersburg, Virginia, July 30th, 1864, a shell wound of the scalp. He was, on August 1st, admitted to the hospital for colored troops at City Point, and, on August 14th, was transferred to the Summit House Hospital, Philadelphia, where he died on September 5th, 1864. Surgeon J. H. Taylor, U. S. V., reported the case.

CASE.—Private *O. J. Hardin*, Co. K, 68th Georgia Regiment, aged 23 years, received at the battle of Gettysburg, Pennsylvania, July 1st, 1863, a gunshot wound of the scalp. He was probably treated in a field hospital until July 20th, when he was admitted to the Chimborazo Hospital, Richmond, Virginia, where he died on August 7th, 1863.

CASE.—Private Daniel C. Harrison, Co. C, 76th Illinois Volunteers, received during the siege of Fort Blakely, Alabama, April 8th, 1865, a severe gunshot wound of the scalp. He was admitted to the field hospital of the Second Division, Thirteenth Corps, and, on April 11th, was ordered to be transferred to the St. Louis Hospital, New Orleans, but died on April 14th, 1865, on the journey. Surgeon O. Peabody, 23d Iowa Volunteers, records the case.

CASE.—Private John Holmes, Co. C, 98th Ohio Volunteers, was struck over the occipital region by a conoidal ball, at Atlanta, Georgia, August 6th, 1864. At the hospital of the Second Division, Fourteenth Corps, and at the Chattanooga Hospital, the injury was regarded as a simple laceration of the scalp. He died at Chattanooga, August 18th, 1864.

CASE.—Private David J. Huganer, Co. K, 6th New York Heavy Artillery, aged 42 years, was wounded, at Cold Harbor, Virginia, May 30th, 1864, by a conoidal ball, which caused a wound of the scalp on the back of the head. He was admitted to the hospital of the Third Division, Fifth Corps; on June 3d, sent to the Stanton Hospital, Washington, D. C., and, on June 21st, transferred to the McDougall Hospital, New York, where he died, on October 5th, 1864, from "exhaustion following gunshot wound." Assistant Surgeon S. H. Orton, U. S. A., reported the case.

CASE.—Private James Ireland, Co. K, 21st Connecticut Volunteers, aged 18 years, received a gunshot wound of the scalp at the battle of Cold Harbor, Virginia, June 3d, 1864. He was, on June 6th, admitted to the Mount Pleasant Hospital, Washington, D. C., and, on June 12th, transferred to the McClellan Hospital, Philadelphia, where the injury is diagnosed as gunshot flesh wound of right cheek. He died on June 16th, 1864. The late Surgeon Lewis Taylor, U. S. A., reported the case.

CASE.—Private *Andrew Jackson*, Co. G, 5th Texas Regiment, was wounded, at the battle of Gettysburg, Pennsylvania, July 3d, 1863, on the right side of the scalp, by a gunshot projectile. He was admitted to the Seminary Hospital, where he died, on July 23d, 1863. Surgeon Henry Janes, U. S. V., recorded the case.

CASE.—Private *Jabez Johnson*, Co. A, 29th Virginia Regiment, was wounded and made a prisoner in the retreat of the Confederate army from the lines of Petersburg, in April, 1865. He was admitted, on April 17th, to the hospital at Point of Rocks, with what appeared to be a lacerated gunshot wound limited to the scalp. He died on April 24th, 1865.

CASE.—Private Wm. A. Johnson, Co. C, 24th Kentucky Volunteers, was wounded in the scalp, by gunshot, at Resaca, Georgia, May 14th, 1864. He was sent to Chattanooga, Tennessee, and died on the day of his admission to Hospital No. 1, May 20th, 1864. Surgeon Francis Salter, U. S. V., reported the case.

CASE.—Sergeant Francis M. Jones, Co. F, 36th Indiana Volunteers, aged 28 years, received, in an engagement at Marietta, Georgia, June 23d, 1864, a severe gunshot wound of the scalp. He was admitted to the hospital of the First Division, Fourth Corps, and, on June 27th, was sent northward. On July 1st, 1864, he entered Hospital No. 1, Nashville, Tennessee, and died, on July 12th, 1864, "from wound." Surgeon B. B. Breed, U. S. V., reported the case.

CASE.—Private Gideon M. Jones, Co. B, 25th Ohio Volunteers, aged 43 years, was wounded, in an engagement at Honey Hill, South Carolina, November 30th, 1864, by a musket ball, which caused a scalp wound of the occipital region. He was, on the following day, admitted to the hospital at Hilton Head. Simple dressings were applied; but death took place on January 14th, 1865, "from wound." Assistant Surgeon C. T. Relier, U. S. V., reported the case.

CASE.—Private Lewis Kumpf, Co. D, 12th Missouri Volunteers, aged 40 years, received, at the battle of Resaca, Georgia, May 14th, 1864, a gunshot scalp wound of the left side of the head. He was, on the same day, admitted to the hospital of the First Division, Fifteenth Corps; on May 23d, was sent to the Field Hospital, Chattanooga, Tennessee, and, on May 25th, transferred to Hospital No. 1, Nashville, Tennessee, where he died on June 5th, 1864.

CASE.—Private Chauncey C. Moore, Co. D, 42d Illinois Volunteers, received, at the battle of Chattanooga, Tennessee, November 24th and 25th, 1863, a gunshot wound of the scalp of the right side of the head. He was treated, for a few days, in a field hospital, and, on December 1st, was admitted to the General Hospital at Chattanooga. He died on December 18th, 1863.

CASE.—Corporal *S. B. Mortes*, Co. K, 1st South Carolina Regiment, was admitted to the Jackson Hospital, Richmond, Virginia, May 15th, 1864, with a gunshot wound of the scalp. He died on May 24th, 1864. Dr. Wellford, C. S. A., recorded the case.

CASE.—Private John Nicholson, Co. D, 56th Massachusetts Volunteers, aged 18 years, received, at the battle of the Wilderness, May 6th, 1864, a gunshot wound of the scalp, over the frontal bone. He was, on May 14th, admitted to the Columbian Hospital, Washington, D. C., where simple dressings were applied. He died on May 30th, 1864. Reported by Surgeon T. R. Crosby, U. S. V.

CASE.—Private Lewis Noble, Co. C, 73d Ohio Volunteers, received, at the engagement at Tunnel Hill, Georgia, July 20th, 1864, a gunshot flesh wound of the head. He was sent from the hospital of the Third Division, Twentieth Corps, for transfer to the rear, and died on his way to Chattanooga, July 25th, 1864.

CASE.—Corporal Lawrence C. Pepoon, (10th Sharpshooters,) 60th Ohio Regiment, aged 21 years, received in an engagement before Petersburg, Virginia, July 6th, 1864, a gunshot wound of the head, obliquely across the occipital protuberance. The bone was apparently uninjured. He was admitted to the hospital of the Third Division, Ninth Corps, where simple dressings were applied to the wound. On July 15th, he was sent to the Filbert Street Hospital, Philadelphia, when death occurred on July 24th, 1864, from "the effects of the wound." Assistant Surgeon S. A. Storrow, U. S. A., reported the case.

CASE.—Private Michael Raher, Co. D, 44th Ohio Volunteers, was struck by a gunshot projectile at Lewisburg, Virginia, May 23d, 1862, receiving a wound of the integuments over the *os frontis* without any injury to the bone. He was admitted to the Washington Park Hospital, Cincinnati, Ohio, on June 16th, and died on June 21st, 1862. Reported by Dr. J. B. Smith.

CASE.—Private Chauncey Reeves, Co. F, 19th Michigan Volunteers, at Resaca, Georgia, May 14th, 1864, was struck by a musket ball, which produced a lacerated wound of the left side of the scalp. He was treated at the hospital of the Third Division, Twentieth Corps. He died on May 16th, 1864. Recorded by Surgeon W. C. Bennett, U. S. V.

CASE.—Private Albert A. Roaks, Co. H, 21st Kentucky Volunteers, aged 36 years, was wounded in an engagement near Marietta, Georgia, June 26th, 1864, by a conoidal musket ball, which caused a flesh wound of the head. He was admitted to the hospital of the First Division, Fourth Corps, and, on the 1st of July, was sent to Hospital No. 1, Nashville, Tennessee, but was transferred, on July 6th, to the Jefferson Hospital, Jeffersonville, Indiana. Death ensued July 20th, 1864.

CASE.—Private James Rowley, Co. C, 4th New York Cavalry, aged 17 years, received in an engagement near Charlestown, Virginia, August 29th, 1864, a gunshot wound of the scalp. He was, on the following day, admitted to the hospital at Sandy Hook, Maryland, where simple dressings were applied. Death occurred on September 1st, 1864, from "effects of wound."

CASE.—Private Wm. Sebring, Co. I, 14th Ohio Volunteers, at Chickamauga, September 19th, 1863, received a lacerated gunshot wound of the left side of the scalp. He was taken to the hospital of the Third Division, Fourteenth Corps, and thence to the Chattanooga Hospital, where he died on October 9th, 1863. Surgeon Israel Moses, U. S. V., reported the case.

CASE.—Sergeant Nelson P. Steinhour, Co. H, 4th New Hampshire Volunteers, aged 23 years, received in an engagement before Petersburg, Virginia, June 30th, 1864, a gunshot wound of the scalp. He was admitted, on July 3d, to the hospital at Fort Monroe. Irritative fever followed, and the patient died from exhaustion, on July 10th, 1864.

CASE.—Corporal William A. Stewart, Co. B, 15th Ohio Volunteers, aged 21 years, received at the battle of Nashville, Tennessee, December 15th, 1864, a simple flesh wound of the scalp. He was admitted to the hospital of the Third Division, Fourth Corps, was thence transferred to Hospital No. 1, Nashville, Tennessee, and, on December 20th, sent to the hospital at Jeffersonville, Indiana, where he died on January 24th, 1865, from the "effects of the wound."

CASE.—Private John Stringer, Co. G, 6th U. S. Colored Troops, received, at Wilmington, North Carolina, February 19th, 1865, a slight lacerated wound of the scalp by a musket ball. At the hospital for Colored Troops, the injury was regarded as trivial, yet death followed from the effects of the wound on February 26th, 1865. Recorded by Surgeon D. W. Hand, U. S. V.

CASE.—Private William Tait, Co. F, 100th Pennsylvania Volunteers, aged 40 years, received, at the battle of Spottsylvania, Virginia, May 12th, 1864, a gunshot wound of the scalp. He was admitted to the hospital of the First Division, Ninth Corps. On May 15th, he was sent to the Mount Pleasant Hospital, Washington, D. C., and, on May 19th, to the McClellan Hospital, Philadelphia, where he died on May 28th, 1864. Surgeon Lewis Taylor, U. S. A., reported the case.

CASE.—Private David Titus, Co. M, 1st New Jersey Cavalry, aged 19 years, received, at the battle of the Wilderness, Virginia, May 5th, 1864, a gunshot wound of the scalp, over the left temporal region. On May 12th, he was admitted to Mount Pleasant Hospital, Washington, D. C., and on June 10th, transferred to DeCamp Hospital, New York Harbor, where he died on June 21st, 1864. Assistant Surgeon Warren Webster, U. S. A., reported the case.

CASE.—Lieutenant John Van De Sande, Co. B, 115th New York Volunteers, aged 31 years, received, in an engagement near Malvern Hill, Virginia, August 16th, 1864, a severe gunshot wound of the scalp. He was, on August 17th, admitted to the hospital at Fort Monroe, Virginia, where he died on September 3d, 1864. Assistant Surgeon E. McClellan, U. S. A., reported the case.

CASE.—Private Jackson W. Vorhees, Co. I, 27th Michigan Volunteers, aged 38 years, received, at the battle of Cold Harbor, Virginia, June 3d, 1864, a gunshot flesh wound of the left temple. He was, on June 8th, admitted to the hospital of the Third Division, Ninth Corps, and on June 14th, to the Second Division Hospital at Alexandria. Simple dressings were applied. Death occurred on June 28th, 1864. Surgeon T. Rush Spencer, U. S. V., reported the case.

CASE.—Private *James Walker*, Co. B, 1st North Carolina Regiment, received a very slight gunshot wound of the scalp, at the battle of Gaines's Mills, Virginia, June 27th, 1862. He was admitted to Howard Grove Hospital, near Richmond, Virginia, and died July 15th, 1862. Surgeon C. D. Rice, P. A. C. S., recorded the case.

CASE.—Private Ezekiel Wimmer, Co. C, 36th Illinois Volunteers, aged 22 years, received, at the battle of Franklin, Tennessee, November 30th, 1864, a gunshot wound of the scalp. He was, on the following day, admitted to Hospital No. 15, Nashville, and, on December 3d, sent to the Jefferson Hospital, Jeffersonville, Indiana, where he died, on December 17th, 1864, from "effects of wound." Surgeon M. Goldsmith, U. S. V., recorded the case.

CASE.—Private Wm. G. Young, Co. G, 44th Illinois Volunteers, aged 24 years, received, at Marietta, Georgia, June 26th, 1864, a gunshot wound of the scalp. He was admitted to the hospital of the Second Division, Fourth Corps, on the following day, and transferred to Chattanooga, on July 2d, and died on July 3d, 1864. Assistant Surgeon C. C. Byrne, U. S. A., reported the case.

CASE.—Sergeant W. H. Zimmerman, Co. E, 11th Pennsylvania Volunteers, aged 25 years, at the battle of the Wilderness, Virginia, May 6th, 1864, received a scalp wound over the right parietal region, from a musket ball, which lodged beneath the integument. The missile was extracted on the field, and the patient was sent to the rear, and conveyed finally to Washington, D. C., entering Armory Square Hospital on May 26th. He died on June 29th, 1864.

Nine patients, with gunshot wounds of the scalp, died while on furlough, and it has been impossible to obtain particulars of the complications which led to the fatal results:

CASE.—Corporal Selah B. Alden, Co. D, 13th Massachusetts Volunteers, aged 32 years, received at the battle of the Wilderness, Virginia, May 8th, 1864, a gunshot wound of the scalp. He was admitted to the regimental hospital, and thence sent to the Campbell Hospital, Washington, D. C., on May 12th. On May 17th he was furloughed, and, according to the registers of the Pension Bureau, and the records of the Adjutant General of Massachusetts, he died at Natick, May 25th, 1864.

CASE.—Private Thomas Bowles, Co. I, 28th Kentucky Volunteers, aged 28 years, received, in an action at Spring Hill, Tennessee, November 29th, 1864, a wound of the scalp by a conoidal musket ball. He was admitted into the field hospital of the Second Division, Fourth Army Corps, and, on the following day, was sent to Nashville and admitted into the No. 8 Hospital. Simple dressings were used. On December 3d, he was tranferred to Jeffersonville, Indiana, and admitted into the general hospital at that place. The report of the Adjutant General of Kentucky states that he died, while on furlough, February 6th, 1865, "from wounds received in action."

CASE.—Private Thomas Bryant, Co. C, 118th Pennsylvania Volunteers, aged 29 years, received, at the battle of the Wilderness, Virginia May 7th, 1864, a slight wound of the scalp from a fragment of shell. He was admitted to the hospital of the First Division, Fifth Corps, and, on May 12th, he was sent to the Campbell Hospital, Washington, D. C. On May 27th he was furloughed, and died while on furlough, July 16th, 1864. Surgeon A. F. Sheldon, U. S. V., reports the case.

CASE.—Private J. H. Chase, Co. I, 106th New York Volunteers, aged 42 years, was admitted to the Lincoln Hospital, Washington, D. C., on August 19th, 1864, with a contused gunshot wound of the scalp. He was furloughed on November 4th, and died while on furlough, December 12th, 1864.

CASE.—Private H. F. Higby, Co. H, 121st New York Volunteers, aged 25 years, was wounded, at the battle of Spottsylvania, Virginia, May 11th, 1864, by a conoidal ball, which cut the scalp at the superior frontal region. He was admitted to the hospital of the First Division, Sixth Corps, and, on May 16th, was sent to the Mount Pleasant Hospital, Washington, D. C. The wound did well, and the patient was furloughed on May 21st. He died, while on leave, May 27th, 1864.

Case.—Private M. F. Hosmer, Co. A, 9th New York Heavy Artillery, aged 18 years, received, at the battle of Cedar Creek, Virginia, October 19th, 1864, a severe gunshot wound of the scalp. He was, on the same day, admitted to the hospital of the Third Division, Sixth Corps, and thence was sent to the Cuyler Hospital at Germantown, Pennsylvania, where he entered on October 24th. He was furloughed on November 6th; and died, while on furlough, December 9th, 1864.

Case.—Lieutenant John Jungerich, Adjutant 121st Pennsylvania Volunteers, received, at the battle of North Anna River, Virginia, May 23d, 1864, a slight gunshot flesh wound over the right side of the frontal bone. He was taken to the hospital of the Fourth Division, Fifth Corps, and thence was sent to Washington. On May 31st, he was granted leave, and died on June 23d, 1864, while on leave of absence.

Case.—Private Robert F. Parkhill, Co. B, 9th New York Artillery, aged 27 years, received, at the battle of Cedar Creek, Virginia, October 19th, 1864, a severe shell wound of the scalp. He was admitted to the hospital of the Third Division, Sixth Corps. On October 24th, he was sent to the Sheridan Hospital, Winchester, Virginia, and thence to the hospital at York, Pennsylvania, which he entered on October 26th. Under simple dressings the wound was doing well, and on November 7th, the patient was furloughed. He died, while on furlough, November 12th, 1864.

Case.—Private William F. Small, Co. B, 7th New Hampshire Volunteers, received, in an engagement in front of Petersburg, Virginia, on May 10th, 1864, a gunshot wound of the scalp, inflicted by a conoidal musket ball. He was admitted into the hospital at Hampton, Virginia, on May 11th, and, on June 8th, was transferred to De Camp Hospital, David's Island, New York. On November 1st, 1864, he was considered convalescent, and received a furlough, and died, while at home, on June 29th, 1865.

The records are silent regarding the causes of death in the sixty-three examples of gunshot wounds of the scalp here enumerated. The average interval between the reception of the injury and the fatal termination was twenty-seven days. It may be suspected that in most, if not all, of these cases, there was some undiscovered primary or secondary lesion of the skull or its contents, but precise evidence on the subject is wanting. The seat of injury is specified in twenty-seven cases; as in the frontal region in seven, the temporal in two, the parietal in twelve, the occipital in six.

Gunshot Scalp Wounds followed by Encephalitis.—In the following cases of gunshot wounds of the scalp, which terminated fatally from inflammation of the brain or its membranes, the reports indicate that the injuries were carefully examined, and that the observers were convinced that there were no primary lesions of the skull:

Case.—Private William H. Allington, Co. C. 141st New York Volunteers, aged 21 years, received, at the engagement before Dallas, Georgia, May 25th, 1864, a gunshot flesh wound of the forehead, from a musket ball. He was admitted into the field hospital of the Twentieth Corps. Simple dressings were used. The patient was transferred to the Cumberland Hospital, Nashville, Tennessee, on June 2d. Meningitis set in soon afterwards, and resulted fatally, on June 11th, 1864. The case is reported by Surgeon C. McDermott, U. S. V.

Case.—Private Albert E. Ammon, Co. H, 27th Indiana Volunteers, aged 21 years, was wounded, in the engagement near Dallas, Georgia, May 25th, 1864, by a conoidal musket ball, which caused a slight wound of the scalp. He was admitted to the hospital of the First Division, Twentieth Corps, and, on June 1st, was sent to the field hospital at Chattanooga, Tennessee. Meningitis supervened, and death took place on June 10th, 1864. Assistant Surgon C. C. Byrne, U. S. A., reports the case.

Case.—Private Simon Birdsell, Co. I, 32d Illinois Volunteers, received a severe gunshot wound of the integuments of the forehead, at the battle of Shiloh, April 6th, 1862. He was treated by Brigade Surgeon William Dickinson, U. S. V., and was conveyed on an hospital steamer to the hospital at Benton Barracks, St. Louis. The wound progressed very favorably, and, on May 5th, the patient was considered convalescent, and was furloughed to go to his home at Iatan, Morgan County, Illinois. Inflammation of the brain supervened, and the case terminated fatally on June 2d, 1862. The attending physician, George M. Smith, M. D., of Iatan, reports the case.

Case.—Private Charles Brown, Co. D, 23d United States Colored Troops, received, in an engagement before Petersburg, Virginia, July 13th, 1864, a severe gunshot wound of the scalp. He was admitted to the hospital of the Fourth Division, Ninth Corps. On July 31st, he was sent to the hospital for colored troops at City Point, and, on August 17th, he was placed on the steamer Baltic for transportation to the Satterlee Hospital at Philadelphia. Surgeon I. I. Hayes, U. S. V., reports that convulsive fits supervened, and that death took place aboard the steamer on August 18th, 1864.

Case.—Private Thomas Casey, Co. F, 11th Illinois Volunteers, was wounded, at Fort Donelson, Tennessee, February 16th, 1862, by a musket ball, which grazed the left side of the head, producing a slight scalp wound, which was considered of trivial importance. The man was sent to the Academy Hospital at Nashville, Tennessee, and remained in a comfortable condition until February 26th, when he complained of violent headache, and soon afterwards became wildly delirious. He was freely purged, and a blister was applied to the nape of the neck, and there was great apparent improvement, until March 10th, when a relapse took place, and symptoms of compression of the brain supervened, terminating eventually in coma. He died on March 21st, 1862. Acting Assistant Surgeon W. P. Jones recorded the case.

CASE.—Sergeant Thomas Elliott, Co. E, 19th Wisconsin Volunteers, aged 28 years, received a lacerated gunshot wound of the scalp, near Petersburg, Virginia, June 30th, 1864, and was taken to the corps field hospital. He was transferred, on the following day, to the base hospital at Point of Rocks, and thence, on July 4th, to Chesapeake Hospital, and thence, on July 14th, to the McDougal Hospital, New York harbor. He died on August 11th, 1864, of subacute encephalitis.

CASE.—Private *John H. Fridley*, Co. K, 28th Virginia Regiment, received, at the battle of Gettysburg, Pennsylvania, July 2d, 1863, a gunshot wound of the head. He was, on the same day, admitted to the Seminary Hospital at Gettysburg, and, on June 17th, he was sent to the hospital at Chester, Pennsylvania. Meningitis set in, and death resulted on August 13th, 1863. Surgeon E. Swift, U. S. A , records the case.

CASE.—Private David Garrett, Co. A, 98th Pennsylvania Volunteers, aged 20 years, received, at the battle of Cedar Creek, Virginia, October 19th, 1864, a gunshot scalp wound. He was taken to the hospital of the Second Division, Sixth Corps, and, on October 23d, he was admitted to the Satterlee Hospital, at Philadelphia. The injury was considered slight, as the patient was furloughed in a short time after his admission. While at home, inflammation of the brain supervened, and he died on November 9th, 1864. The case is reported by Surgeon I. I. Hayes, U. S. V.

CASE.—Private Augustus Hether, Co. K, 98th Pennsylvania Volunteers, aged 46 years, was wounded at the battle of Spottsylvania Court House, Virginia, May 12th, 1864, by a conoidal musket ball, which severely lacerated the scalp. He was immediately conveyed to the hospital of the Second Division, Sixth Corps; thence transferred to the First Division Hospital at Alexandria. Death resulted on June 17th, 1864. Surgeon E. Bentley, U. S. V., reports the case.

CASE.—Sergeant William P. Holden, Co. G, 2d Maine Volunteers, aged 26 years, was admitted to the hospital at Annapolis, Maryland, on November 15th, 1862, with a gunshot wound of the integuments of the forehead. The wound granulated kindly, and cicatrization was almost complete, and the patient improved steadily until May 5th, 1863, when he was attacked by a severe pain in the head, which rapidly increased and became intense, in spite of counter irritation and anodyne applications. Death took place on May 5th, only six hours from the time that the pain first set in. At the autopsy, the anterior lobe of the cerebrum was found softened and disorganized. There were four ounces of pus in the lateral ventricle. Surgeon T. A. McParlin, U. S. A., reported the case.

CASE.—Private Celestus Jenkins, Co. H, 9th New York Artillery, aged 22 years, was wounded at the battle of Winchester, Virginia, September 19th, 1864, by a fragment of shell, which caused a severe wound of the right temporal region without injury of bone. He was, on the same day, admitted to the hospital of the Third Division, Sixth Corps, and was thence conveyed to Philadelphia, and admitted, on the 27th, into the Filbert Street Hospital. Death resulted on the 9th of October, 1864. Surgeon Thomas B. Reed, U. S. V., records the case.

CASE.—Private *H. B. Johnson*, Co. G, 15th Alabama Infantry, aged 19 years, received, at the battle of Fredericksburg, Virginia, December 13th, 1862, a gunshot wound of the scalp in the left parietal region. He was admitted into No. 12 hospital, at Richmond, on December 16th. Symptoms of inflammation of the brain made their appearance, and several convulsions followed. The scalp was shaved, and cold lotions were applied, and mercurials were administered. He died January 4th, 1863. Surgeon W. H. Thom, C. S. A., reports the case.

CASE.—Corporal John Kealey, Co. A, 99th Pennsylvania Volunteers, aged 21 years, received, while on the picket line before Petersburg, Virginia, September 12th, 1864, a gunshot scalp wound of the vertex, from a conoidal musket ball. He was admitted, on September 15th, into the field hospital of the Third Division, Second Corps. On September 19th, the patient was sent to field hospital of the Second Corps, and, on the same day, he was transferred to Washington, where, on September 21st, he was admitted into Emory Hospital. Inflammation of the brain set in, and death followed, October 3d, 1864. Surgeon N. R. Moseley, U. S. V., reported the case.

CASE.—Sergeant Thomas H. Law, Co. K, 5th New Hampshire Volunteers, received, at the battle of Antietam, Maryland September 17th, 1862, a gunshot wound of the integuments of the forehead. He was admitted to the hospital of the Second Corps, and, on October 5th, was sent to the Ladies Home Hospital at New York. An abscess of the scalp formed, and meningitis ensued, terminating in compression of the brain, coma, and death on October 11th, 1862. Surgeon A. B. Mott, U. S. V., reports the case.

CASE.—Private *S. Lawson*, Co. E, 22d Georgia Regiment, received, at the battle of Gettysburg, Pennsylvania, July 3d, 1863, a gunshot wound of the scalp, and was taken to the Seminary Hospital. On July 25th, he was transferred to the West's Building Hospital, Baltimore, Maryland, where he died on September 6th, 1863.

CASE.—Private *J. A. Murphy*, Co. B, 49th Virginia Regiment, aged 30 years, received, at the battle of Gettysburg, Pennsylvania, July 3d, 1863, a gunshot wound of the right side of the scalp. He was, on July 6th, admitted to Hospital No. 1, Frederick, Maryland, on July 7th, transferred to Annapolis, probably for exchange, and on August 1st, 1863, he was admitted to a Confederate hospital, at Petersburg, Virginia, where he died, on August 18th, 1863, of meningitis.

CASE.—Private Hugh O'Donnell, Co. C, 29th Pennsylvania Volunteers, aged 24 years, received, at the battle of Atlanta, Georgia, July 20th, 1864, a severe gunshot wound of the scalp. He was admitted into the hospital of the Second Division, Twentieth Corps, and thence sent to Hospital No. 2, at Chattanooga, Tennessee, on July 25th. He was transferred, about the 1st of August, to Nashville, and thence, within a few weeks, sent to the Satterlee Hospital in Philadelphia. Death supervened on August 31st, 1864.

CASE.—Private *Duncan Stone*, Co. C, 1st North Carolina Battery, received a wound of the right side of the scalp by a conoidal musket ball. He was admitted into the Pettigrew Hospital, Raleigh, North Carolina, on March 23d, 1865. Simple dressings were used. Meningitis supervened, and the case terminated fatally on March 29th, 1865. Surgeon E. Burke Haywood, C. S. A., records the case.

CASE.—Private Nicholas Strayer, Co. C, 205th Pennsylvania Volunteers, aged 30 years, received, in an engagement before Petersburg, Virginia, April 2d, 1865, a gunshot wound of the scalp above the left ear. He was admitted to the hospital of the Third Division, Ninth Corps, and, on April 4th, was sent to the Lincoln Hospital, Washington, D. C., where he died on May 12th, 1865, from inflammation of brain. Assistant Surgeon J. C. McKee, U. S. A., records the case.

CASE.—Private Henry Warner, Co. B, 1st Michigan Volunteers, aged 29 years, was wounded near Petersburg, Virginia, July 24th, 1864, by a fragment of shell, which caused a severe wound of the scalp. He was admitted to the hospital of the First Division, Fifth Corps, and thence sent to City Point, where he remained under treatment until the 6th of August. He was then transferred, by steamer, to the De Camp Hospital at David's Island, New York Harbor, where death resulted on August 20th, 1864.

CASE.—Private John Warner, Co. D, 4th New Jersey Volunteers, aged 26 years, received, at the battle of the Wilderness, May 6th, 1864, a gunshot wound of the scalp, by a conoidal musket ball. He was taken to the hospital of the First Division of the Sixth Corps, and transferred to the Finley Hospital, at Washington, on May 11th; from thence he was sent to Philadelphia, and admitted to the Satterlee Hospital on May 18th. On May 28th, he was attacked by a chill, attended by a violent pain in the head, and symptoms of cerebral inflammation. The case terminated fatally on May 29th, 1864.

CASE.—Corporal James E. White, Co. A, 3d New Hampshire Volunteers, aged 33 years, received, in an engagement near James's Plantation, Virginia, May 20th, 1864, a gunshot wound of the scalp from a conoidal musket ball. He was admitted into the field hospital of the Tenth Corps on the same day, and a day later was transferred to the Hampton Hospital at Fort Monroe. On June 1st, the patient was sent to the Ward Hospital, at Newark, New Jersey. Congestion of the brain supervened, and death resulted on July 14th, 1864. The late Assistant Surgeon J. T. Calhoun, U. S. A., recorded the case.

In eight fatal cases of gunshot wounds of the scalp, it may be inferred, from the nature of the prescriptions, that some form of encephalitis supervened and induced fatal results; but the precise features of the secondary complications were not reported:

CASE.—Private John Aufterheide, Co. B, 6th Ohio Volunteers, received, at the battle of Chickamauga, Georgia, September 19th, 1863, a severe gunshot flesh wound of the head. He was, at once, admitted to the hospital of the Second Division, Twenty-first Corps, and, on the next day, sent to the General Hospital at Chattanooga, Tennessee, where he died, on September 22d, 1863. Surgeon A. J. Phelps, U. S. V., recorded the case.

CASE.—Private A. L. Cook, Co. E, 16th Connecticut Volunteers, received, in the engagement at Plymouth, North Carolina, April 20th, 1864, a gunshot wound of the scalp. He died on May 9th, 1864. Surgeon D. G. Rush, 101st Pennsylvania Volunteers, recorded the case.

CASE.—Private Isaac Hamlin, Co. F, 101st Illinois Volunteers, received, near Dallas, Georgia, May 25th, 1864, a slight gunshot wound of the head. He was admitted into the field hospital of the Third Division, Twentieth Army Corps, on the same day, and, on May 30th, he was sent to Chattanooga. He died on June 16th, 1864.

CASE.—Private *J. H. Hatley*, Co. D, 27th North Carolina Infantry, received, in action, a gunshot wound of the scalp. He was admitted into the Moore Hospital at Richmond, Virginia, December 20th, 1863, and died on December 22d. Surgeon Otis F. Manson, C. S. A., recorded the case.

CASE.—Private *J. Hinton*, Co. C, 28th Alabama Regiment, was wounded and made a prisoner at the battle of Chattanooga, and was admitted, on November 23d, 1863, to Hospital No. 4, Chattanooga, Tennessee, with a gunshot scalp wound over the forehead. He died on December 15th, 1863. Surgeon Francis Salter, U. S. V., reports the case.

CASE.—Private Clarence R. Smith, Co. A, 94th New York Volunteers, was admitted to the Patent Office Hospital, Washington, D. C., on September 21st, 1862, with a gunshot wound of the scalp. He died on October 1st, 1862. Assistant Surgeon J. J. Woodward, U. S. A., recorded the case.

CASE.—Private Hiram Voiles, Co. F, 70th Indiana Volunteers, received, at the battle of Resaca, Georgia, May 15th, 1864, a slight gunshot wound of the right side of the scalp. He was admitted to the hospital of the Third Division, Twentieth Corps, and, on May 20th, was sent to the general field hospital at Resaca, where he died, on May 24th, 1864. Assistant Surgeon M. C. Woodworth, U. S. V., recorded the case.

CASE.—Private Madison Wilman, Co. D, 15th Iowa Volunteers, aged 26 years, received, at the battle of Shiloh, Tennessee, April 6th, 1862, a slight gunshot wound of the scalp. He died on June 1st, 1862. Surgeon Samuel B. Dawes, 15th Iowa Volunteers, reported the case.

Erysipelas.—The proportion of cases in which erysipelas supervened after gunshot wounds limited to the integuments of the cranium, was by no means large. But twenty-two cases were reported, of which eight terminated fatally. It is highly probable that this complication was present, in a mild form, in many of the cases reported without commentary as "returned to duty;" but was seldom of such gravity as to be made the subject of special report. The few exceptions are here noted:

CASE.—*J. B. Bristoe*, Co. C, 26th Virginia Regiment, aged 30 years, received, on July 17th, 1864, a gunshot wound of the scalp, just above the right eye. During the progress of the case erysipelas supervened, but it was checked, and, on July 30th, the patient was reported as convalescing. Surgeon P. F. Brown, C. S. A., records the case.

CASE.—Private Charles Ferry, Co. B, 72d New York Volunteers, aged 37 years, received, in the Peninsular campaign, at Malvern Hill, July 1st, 1862, a shell wound of the occipital region of the scalp. He was admitted to Division No. 1 Hospital, at Annapolis, Maryland, from the Steamer Kennebec, July 5th, 1862. A severe attack of erysipelas supervened, from which the patient recovered, and was returned to duty on October 11th, 1862. Acting Assistant Surgeon Arthur Rich recorded the case.

CASE.—Private Henry T. Frazell, Co. B, 6th Missouri Volunteers, received in front of Vicksburg, Mississippi, May 22d, 1863, a gunshot wound of the scalp in the right temporal region. He was received on board the hospital steamer R. C. Wood, from Chickasaw Bayou, on the 8th of June, and transferred to Memphis, Tennessee, where, on the same day, he was admitted to Union Hospital. On the morning of the 29th, the wound was attacked by erysipelas, which soon extended over the entire scalp and face. The disease yielded readily to treatment, and, on July 7th, the patient was reported as very nearly free of the disease. On the 22d of July, he had so completely recovered as to be able to return to duty. The case is reported by Surgeon J. D. Brumley, U. S. V.

CASE.—Private *T. A. Gallagher*, Co. C, 10th Louisiana, was wounded at the battle of Gettysburg, Pennsylvania, July 3d, 1863, by a musket ball, which entered the scalp to the left of the median line, near the superior ridge of the occiput. The missile passed forward, and downward behind the ear, and lodged about the middle of the lower jaw. He also received a gunshot wound of the ankle. The wounds were dressed in a field hospital, and thence he was sent to Camp Letterman Hospital at Gettysburg, where he was admitted on July 27th. Erysipelas supervened, which, by appropriate treatment, was subdued, and, at the date of his transfer to Baltimore, the patient was doing well. He was admitted, on October 6th, to West's Building Hospital, at Baltimore, Maryland, where he remained until November 12th, 1863, on which date he was paroled.

CASE.—First Sergeant Samuel B. Gray, Co. I, 123d Illinois Volunteers, in an engagement near Milton, Tennessee, March 20th, 1863, received a gunshot scalp wound. He was admitted into Hospital No. 1, at Murfreesboro, March 21st, and transferred thence to Nashville, and admitted, on May 22d, in Hospital No. 23. He remained here until August 1st, when he was sent to Louisville, and admitted into Hospital No. 7. On September 3d. he was sent to Hospital No. 19, where erysipelas supervened. Simple dressings were used. He was discharged from service October 13th, 1863, on account of a scrofulous abscess. The case is reported by Assistant Surgeon E. O. Brown, 26th Kentucky Volunteers.

CASE.—Sergeant R. M. Harris, Co. F, 3d Tennessee Infantry, aged 24 years, received at the battle of Kenesaw Mountain, Georgia, June 30th, 1864, by a conoidal ball, a wound of the scalp over the right temple. He was admitted, on July 11th, to Holston Hospital, at Knoxville, Tennessee. The wound became affected with erysipelas, which was subdued, and the patient was furloughed on the 26th of October. On November 18th, he was admitted to Asylum Hospital at Knoxville, where he remained until February 4th, 1865, when he was returned to duty. The case was reported by Acting Assistant Surgeon S. L. Herrick.

CASE.—Sergeant John McPeake, Co. B, 82d New York Volunteers, received, at the battle of Antietam, Maryland, September 17th, 1862, a gunshot wound of the integuments of the forehead. He was admitted to the regimental hospital, and, on November 21st, was sent to hospital at Camp Parole, Annapolis, Maryland. Erysipelas of a severe character supervened, but the patient recovered, and was discharged from the service on February 23d, 1863. Surgeon James Norval, 79th New York State Militia, recorded the case.

CASE.—Private *J. L. Means*, Texas Regiment, received, in the assault on Fort Donelson, Tennessee, February 15th, 1862, a slight wound of the scalp, over left parietal region, by a musket ball. He was conveyed to a Confederate hospital in Nashville. Erysipelas set in, on the tenth day after the reception of the injury, and extended over the entire head and face. Tincture of iodine was applied locally, and general supporting treatment was employed. He rapidly recovered, and was discharged from the hospital about March 26th, 1862, for duty.

CASE.—Private *J. L. Smiley*, Co. E, 12th Alabama Infantry, aged 19 years, received, in the assault on Fort Steadman, Virginia, March 25th, 1865, a gunshot wound of the occipital region, by a conoidal musket ball. He was admitted into the Washington Street Hospital, at Petersburg, Virginia, on the same day. Erysipelas supervened. The patient was made a prisoner and transferred to the Hampton Hospital, at Fort Monroe, May 17th, and on May 25th, 1865, he was sent to the Military Prison. Assistant Surgeon B. F. Pope, 10th New York Artillery, reports the case.

CASE.—Private William H. Smith, Co. I, 99th Pennsylvania Volunteers, aged 18 years, received, in an action on the Southside Railroad, Virginia, about April 7th, 1865, a gunshot wound of the right parietal region. He was admitted into the field hospital of the Third Division, Second Corps. Simple dressings were applied. On April 12th, he was admitted into the Second Corps field hospital, at City Point, whence he was transferred, on April 18th, to Finley Hospital, Washington. On April 21st, erysipelas attacked the scalp and face. Tincture of iodine, and lead and opium washes, and poultices were used. He was admitted into Mower Hospital, Philadelphia, May 19th, and on July 19th, 1865, he was discharged from service.

CASE.—Private *F. M. Strecter*, Co. G, 42d Mississippi Infantry, received a gunshot wound of the scalp. He was admitted, on July 23d, 1863, into the Howard Grove Hospital, Richmond, Virginia. Erysipelas supervened. On September 16th, 1863, he was furloughed. The case is reported by Surgeon C. D. Rice, P. A. C. S.

CASE.—Private *L. H. Taylor*, Co. A, 46th Virginia Regiment, was admitted, on July 2d, 1864, to the Howard Grove Hospital, Richmond, Virginia, with a gunshot wound of the scalp. Erysipelas supervened; but otherwise the case progressed favorably, and the patient was furloughed, on July 31st, 1864, for thirty days. Surgeon C. D. Rice, P. A. C. S., recorded the case.

Another case of erysipelas of the scalp, complicated by hæmorrhage, will be recorded further on among the abstracts of scalp wounds with hæmorrhage. Still another affords an instance of the application of sutures in gunshot lacerations of the scalp:

CASE.—Private James Buchanan, Co. C, 6th Iowa Volunteers, aged 35 years, received at the battle of Resaca, Georgia, May 14th, 1864, a lacerated wound of the vertex of the scalp, from a fragment of shell. The cranium was laid bare for a distance of two and a half inches. He was admitted to the field hospital of the Fifteenth Army Corps, in charge of M. C. Woodworth, Assistant Surgeon U. S. V., on the same day, and the wound was cleaned, the scalp shaved, and its edges approximated by sutures. The wound was then covered with water dressings. The next report is dated May 20th, when it is stated that the wound was tumefied, highly inflamed, suppurating, and gaping, the sutures having broken out. The wound was cleaned of purulent matter, and was dressed with strips of isinglass plaster, and covered by a compress. On the 21st, there was erysipelatous inflammation extending from the vertex over the forehead nearly down to the eyelid. The wound was dressed with plasters, as before, and strong tincture of iodine was painted over the entire inflamed surface and a border of the sound skin adjacent. On the 22d, the erysipelas extended slightly downwards to the face. On the 25th, the inflammation had, in a great measure, subsided. The patient was transferred to the Cumberland Hospital, at Nashville, Tennessee, under the care of Surgeon C. McDermont, U. S. V., and was treated by simple dressings to the scalp and with purgatives. On June 4th, he was transferred to the Holt Hospital, at Jeffersonville, Indiana, in charge of Surgeon H. P. Stearns, U. S. V. It is stated on the register of this hospital, that the wound was inflicted by a conical musket ball. The patient recovered without further complication, and was returned to duty August 19th, 1864.

Eight cases were reported which terminated fatally in consequence of the meningeal inflammation following the invasion of erysipelas:

CASE.—Private Lewis Alfrey, Co. K, 22d Indiana Volunteers, received, in an engagement at Kenesaw Mountain, Georgia, June 27th, 1864, a gunshot wound of the scalp. He was admitted to the hospital of the Second Division, Fourteenth Corps, and, on July 1st, was transferred to the Cumberland Hospital at Nashville, Tennessee. He died, on July 26th, 1864, "of erysipelas, following gunshot wound of scalp." Assistant Surgeon W. B. Trull, U. S. V., records the case.

CASE.—Corporal William Cammire, Co. H, 73d Illinois Volunteers, aged 22 years, was admitted to hospital No. 19, Nashville, Tennessee, on December 1st, 1864, with a gunshot wound of the left side of the scalp. Erysipelas of the head and face supervened, and the case had a fatal termination on December 4th, 1864.

CASE.—Private *James B. Fant*, Co. B, 17th Mississippi Regiment, was, on May 9th, 1864, admitted to the Howard Grove Hospital, Richmond, Virginia, with a lacerated wound of thescalp in the left temporal region, caused by a grape shot. On July 8th, erysipelas attacked the wound, and death resulted on July 29th, 1864. Surgeon T. M. Palmer, C. S. A., records the case.

CASE.—Private William Jackson, Co. F, 16th Ohio Volunteers, received, at the siege of Vicksburg, Mississippi, December 28th, 1862, a gunshot wound of the left side of the scalp. He was conveyed, on the steam transport City of Memphis, to Paducah, Kentucky, and was admitted, on January 8th, 1863, into Hospital No. 2. Erysipelas of the scalp supervened, and death resulted from exhaustion, on February 23d, 1863. At the *post mortem* examination the liver, spleen, and mesenteric glands were found enlarged. The case is reported by Surgeon H. P. Stearns, U. S. V.

CASE.—Corporal *Francis N. Lewis*, Co. E, 18th North Carolina Regiment, received, in an engagement before Petersburg, April 1st, 1865, a gunshot wound of the scalp. He was, on April 4th, admitted to the hospital at Fort Monroe, where he died, on April 13th, 1865, of erysipelas. Assistant Surgeon W. D. Wolverton, U. S. A., records the case.

CASE.—Private Reinhold Maywold, Co. G, 6th Wisconsin Volunteers, aged 27 years, was wounded, in an engagement at the Southside Railroad, April 1st, 1865, by a conoidal ball, which struck over the squamous portion of the left temporal bone. He was, on the following day, admitted to the field hospital of the Fifth Corps, and, on April 4th, was sent to the Lincoln Hospital, Washington, D. C., where he died, on April 24th, 1865, from erysipelas following gunshot wound of scalp.

CASE.—Private Fountain McClarry, Co. E, 100th U. S. Colored Troops, aged 24 years, received, at the battle of Nashville, December 16th, 1864, a gunshot wound of the scalp, on the back of the head. He was admitted, on the following day, to Hospital No. 16. Simple dressings were applied. Erysipelas supervened, and death followed, on January 14th, 1865.

CASE.—Private John Williams, Co. B, 12th New Jersey Volunteers, aged 30 years, received, in the attack on Petersburg, Virginia, June 17th, 1864, a shell wound of the left side of the scalp. He was admitted, on June 19th, to the hospital of the Second Corps at City Point, and, on June 25th, was sent to the Lovell Hospital, Portsmouth Grove, Rhode Island. Erysipelas supervened, and death occurred on July 7th, 1864.

Gangrene.—The contused wounds of the scalp made by balls, always followed by the death of a thin layer of tissue, sometimes lead to spreading gangrene, a complication more common in head wounds with fracture of the skull than in those limited to the scalp. In the latter class, but nine cases of traumatic gangrene were reported, of which four terminated fatally.

CASE.—Private Joseph H. Clouse, Co. H, 20th Indiana Volunteers, was wounded at the battle of Gettysburg, Pennsylvania, July 3d, 1863, by a conoidal ball, which entered just above the frontal eminence of the left side, and made a large flesh wound. He was sent to Philadelphia, and, on July 5th, admitted to the Satterlee Hospital. Cold water dressings were applied until the 11th, when flax-seed poultices were used. The wound did comparatively well until the 20th, when gangrene appeared. Tincture of the sesquichloride of iron was given, and applications of nitric acid, followed by emollient dressings, were made for a few days, when the sloughs came away, and the wound commenced to heal. On the 24th, the edges were approximating. About a square inch of the bone was visible, one-half of which was denuded of its periosteum. The patient was furloughed on August 2d, 1863; returned to his regiment, and was, on December 22d, 1863, transferred to Co. F, 20th Indiana Regiment, reorganized.

CASE.—Private *William Padget*, Co. B, 1st Florida Battery, was admitted, on June 4th, 1864, to Howard Grove Hospital, Richmond, Virginia, with a gunshot wound of the scalp over the left temporal bone. Gangrene attacked the wound, but was readily checked, and on July 23d the patient was furloughed for sixty days.

CASE.—Private Horace Garrquis, Co. E, 8th Connecticut Volunteers, aged 20 years, received, in an engagement before Petersburg, Virginia, May 7th, 1864, a gunshot wound of the scalp. He was, on May 9th, admitted to the Hampton Hospital near Fort Monroe, and, on May 18th, transferred to the Mower Hospital, Philadelphia. On May 30th, the wound commenced to slough. Bromine was applied, and afterwards flax-seed poultices, and on June 15th, healthy granulation set in. On July 11th, the patient was sent to the Knight Hospital, New Haven, Connecticut, and on October 11th, 1864, he was returned to duty.

CASE.—Private John R. Kittredge, Co. I, 93d New York Volunteers, aged 20 years, was wounded at the battle of the Wilderness, Virginia, May 5th, 1864, by a conoidal ball, which passed across the vertex of the cranium from left to right, causing a scalp wound two inches in length. He was admitted to the hospital of the Third Division, Second Corps; on May 10th, sent to the Carver Hospital, Washington, D. C., and, on May 15th, transferred to Mower Hospital, Philadelphia. On June 14th, the wound began to slough; poultices were applied, and on June 18th the sloughing had ceased. Kittredge was returned to duty on October 4th, 1864.

CASE.—Private *W. I. Watson*, Co. D, 20th Georgia Cavalry, received, on October 27th, 1864, a gunshot wound of the scalp. He was admitted into the second division of the Jackson Hospital, Richmond, on the same day. Gangrene supervened. He recovered, and was furloughed March 24th, 1865.

The following cases of sloughing after gunshot wounds of the scalp, terminated fatally:

CASE.—Private Daniel L. Dougherty, Co. H, 55th Pennsylvania Volunteers, aged 27 years, was wounded before Petersburg, Virginia, June 16th, 1864, by a conoidal ball, which injured the scalp and the left shoulder. He was, on the following day, admitted to the hospital of the Eighteenth Corps, at Point of Rocks, Virginia, and, on June 19th, was sent to the Hampton Hospital, Fort Monroe, where simple dressings were applied to the wound. Death occurred on July 15th, 1864, from gangrene and exhaustion. Assistant Surgeon E. McClellan, U. S. A., recorded the case.

CASE.—Private Patrick Doyle, Co. D, 117th New York Volunteers, aged 36 years, was wounded before Petersburg, Virginia, June 15th, 1864, by a fragment of shell, which caused a wound of the scalp. He was treated, for some days, in a field hospital, and thence, on June 24th, transferred to the Mount Pleasant Hospital, Washington, D. C., and, on June 27th, sent to the Satterlee Hospital, Philadelphia. Gangrene attacked the wound, and the patient died on July 30th, 1864.

CASE.—Private Irvine Hawkins, Co. I, 2d, New York Artillery, aged 19 years, received, in an engagement at Petersburg, Virginia, June 16th, 1864, a gunshot wound of the occipital region, by a round ball. He was admitted, on the same day, into the field hospital of the First Division, Second Army Corps, and, on the 21st, was sent to the base hospital at City Point. Simple dressings were used. The patient was subsequently transferred to Washington, and was received into the Mount Pleasant Hospital on June 27th. He was, a few days later, sent to the Chester Hospital in Pennsylvania. The wounds fell into a sloughing condition, and death resulted from the consequent exhaustion, July 28th, 1864. Surgeon Thomas H. Bache, U. S. V., reports the case.

CASE.—Corporal William Roth, Co. E, 119th New York Volunteers, aged 28 years, received, at the battle of Gettysburg, Pennsylvania, July 3d, 1863, a scalp wound in the left parietal region, and also a wound through the left latissimus dorsi muscle. He was conveyed to Philadelphia, and, on July 5th, was admitted to the Satterlee Hospital. Both wounds were gangrenous. Charcoal poultices were applied, after cauterization by nitric acid. On July 26th, the wounds looked healthy; but, on July 29th, excessive diarrhœa supervened, followed by chills and headache, and death occurred on August 2d, 1863. The case is reported by Acting Assistant Surgeon N. Hickman.

Hæmorrhage.—In gunshot wounds of the scalp, primary hæmorrhage was very infrequent, but secondary hæmorrhage was not uncommon, and proved, when it occurred, a very troublesome complication. Abstracts will be given of all the cases, twenty-one in number, reported in detail:

CASE.—Private Thomas Bell, Co. A, 9th Pennsylvania Volunteer Reserves, a paroled prisoner, was admitted to hospital at Annapolis, Maryland, on January 11th, 1863. He had been wounded by a musket ball, which entered the scalp to the right of the occipital protuberance, and, passing forward and slightly upward, emerged at a distance of two inches above the ear. The missile, in its course, cut the occipital artery, from which there was profuse hæmorrhage. Sight and hearing were some-

what affected; but, on the date of his leaving the hospital, the patient was doing well. He was transferred, on January 21st, 1863, to Pittsburg, Pennsylvania, after which there is no account of him. Surgeon T. A. McParlin, U. S. A., records the case.

Case.—Private Burton Fuller, Co. H, 7th Iowa Volunteers, was wounded, at the battle of Corinth, Mississippi, October 3d, 1862, in the right temple. The missile entered on a line with the external canthus of the right eye, severing the temporal artery, and lodged. He was, on October 13th, 1862, admitted to the Hospital at Mound City, Illinois, where the temporal artery was ligated. Fuller was discharged from the service on January 13th, 1863.

Case.—Private John Hearne, Co. E, 164th New York Volunteers, was wounded, in an engagement near Suffolk, Virginia, April 24th, 1863, in the right temporal region, the missile dividing the temporal artery, which bled freely. The hæmorrhage was checked by compression, and the patient was sent, on the following day, to the hospital at Hampton, Virginia. On June 22d, 1863, he was returned to duty.

Case.—Lieutenant A. St. Clair Smith, Co. E, 12th New Hampshire Volunteers, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball, which cut the scalp over the left ear and severed the temporal artery, which was secured with some difficulty. He was admitted, on June 5th, to the field hospital of the Eighteenth Corps, and thence sent to Washington, D. C., and was treated, at his quarters, at the Avenue House. He was furloughed, on June 11th, 1864, and was finally mustered out with his regiment, on June 21st, 1865. Acting Assistant Surgeon G. K. Smith recorded the case.

Case.—Corporal John C. Taylor, Co. D, 5th New Jersey Volunteers, aged 44 years, received, at the battle of Fair Oaks, June 1st, 1862, a gunshot wound of the scalp. He was sent to the Seminary Hospital at Georgetown, D. C., and admitted on June 4th. Profuse hæmorrhage occurred, on the same day, from one of the branches of the temporal artery. The main trunk was ligated, just above the zygomatic process. The patient was returned to duty on August 19th, 1862. The case is reported by Acting Assistant Surgeon Josiah F. Kennedy.

In six cases of secondary hæmorrhage from gunshot wounds of the scalp, the bleeding was controlled by pressure and by styptics:

Case.—Private G. A. Arnold, Co. G, 2d Vermont Volunteers, aged 21 years, was wounded, at the battle of the Wilderness, Virginia, May 5th, 1864, by a conoidal musket ball, which caused a wound of the scalp in the right parietal region. He was admitted to the Harewood Hospital, Washington, D. C., and, on May 15th, sent to Mower Hospital, Philadelphia. On the following day hæmorrhage occurred from the parietal branch of the temporal artery, which was controlled by compression. On May 31st, the wound had nearly healed, but the patient suffered from headache. He was returned to duty on July 26th, 1864.

Case.—Private John Gallager, Co. G, 5th New Jersey Volunteers, aged 25 years, was wounded at the battle of the Seven Pines, Virginia, June 1st, 1862, by a round ball, which struck in the right parietal region, two inches from vertex, laying the bone bare. He was conveyed to Washington, and admitted, on June 4th, into the Seminary Hospital, Georgetown. A hæmorrhage took place from the temporal artery on the same day. The patient suffers from occasional attacks of vertigo. On July 18th, he was transferred to the Union Hotel Hospital, in the same place, and, on July 25th, 1862, was returned to duty. Assistant Surgeon Joseph R. Smith, U. S. A., reports the case.

Case.—Private Zachariah Hancock, Co. I, 19th Indiana Volunteers, was wounded, at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a buckshot, which entered behind the left ear and lodged. He was, on the same day, admitted to the Seminary Hospital, Gettysburg, and, on July 11th, sent to the McClellan Hospital, Philadelphia. Hæmorrhage, amounting to twelve ounces, occurred on the following day, but was arrested by pressure and a solution of the persulphate of iron. The patient was discharged on December 3d, 1863. Surgeon Lewis Taylor, U. S. A., records the case.

Case.—Private John Lowrey, Co. I, 2d United States Infantry, aged 29 years, was wounded, at the battle of Antietam, Maryland, September 17th, 1862, in the right temporal region. He was, on September 22d, admitted to Hospital No. 5, Frederick, Maryland, and, on October 10th, sent to McDougall Hospital, Fort Schuyler, New York Harbor. On October 16th, hæmorrhage occurred from the temporal artery, but was easily controlled by compresses and styptic preparations. The patient was returned to duty on November 4th, 1862.

Case.—Private John O'Connor, Co. I, 20th Massachusetts Volunteers, aged 21 years, received, at the battle of Gettysburg, Pennsylvania, July 2d, 1863, a wound of the scalp near the vertex, by a fragment of shell. He was admitted into a field hospital, and, a few days later, was sent to Philadelphia, and admitted, on July 7th, into the Mower Hospital. On July 11th, a considerable hæmorrhage took place, which was controlled by a compress and styptics. He deserted October 5th, 1863. The case is reported by J. Hopkinson, Surgeon U. S. V.

Case.—Private Henry Schurringhausen, Co. I, 1st Ohio Light Artillery, aged 25 years, was wounded in the forehead, by a buckshot, in the engagement at Chantilly, Virginia, September 1st, 1862. He was admitted to the Master Street Hospital, Philadelphia, on September 3d, 1862. The injury was regarded as slight, but subsequent sloughing caused hæmorrhage from the frontal artery on September 10th. The bleeding was readily arrested by continuous pressure and Monsell's dry salt. The wound healed, and the patient was discharged from the service on January 4th, 1865.

In eight cases, the bleeding was successfully treated by ligating the wounded vessel:

Case.—Lieutenant Henry Gilmore, Co. A, 17th Vermont Volunteers, aged 32 years, received, at the battle of Spottsylvania, Virginia, May 12th, 1864, a gunshot flesh wound of the head. He was treated in a field hospital until May 19th,

when he was sent to the Campbell Hospital, Washington, D. C. On admission, the wound was in a bad condition; the temporal bone was exposed to view, and the tissues were sloughing and inclined to gangrene. On May 21st, hæmorrhage occurred from the temporal artery. Acting Assistant Surgeon F. W. Kelly, ligated the artery in its continuity. No untoward symptoms occurred. On August 15th, Lieutenant Gilmore was transferred to the Officers' Hospital, at Annapolis, Maryland, and, on September 6th, 1864, he was returned to duty. Surgeon A. F. Sheldon, U. S. V., records the case.

Case.—Private *F. C. Hartly*, Co. G, 49th Virginia Regiment, aged 21 years, was admitted on June 1st, 1864, to Chimborazo Hospital, Richmond, Virginia, with a gunshot wound of the scalp, received on May 31st, 1864. On June 5th hæmorrhage occurred from the anterior branch of the temporal artery, which was ligated near the expansion of the temporal muscle. On June 30th, the patient was doing well, and, on July 1st, he was furloughed for sixty days.

Case.—Private Josiah Mullen, Co. A. 100th Pennsylvania Volunteers, was wounded during the siege of Knoxville, Tennessee, November 30th, 1863, by a conoidal ball, which struck the left side of the head and severed the temporal artery. He was at once admitted to Hospital No. 5, Knoxville, where Surgeon George B. Coggswell, 29th Massachusetts Volunteers, ligated the temporal artery near its origin. The ball was not discovered until December 5th, when it was extracted from beneath the sterno-cleido-mastoid muscle, near the sternal extremity. The patient recovered, was furloughed on February 17th, 1864, and finally returned to duty. The case is reported by Surgeon A. M. Wilder, U. S. V.

Case.—Private Henry Reese, Co. I, 53d Pennsylvania Volunteers, aged 18 years, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a shell, which caused a flesh wound over the right temple. He was, on July 5th, admitted to the Satterlee Hospital, Philadelphia. On July 13th, hæmorrhage, amounting to four ounces, occurred from the temporal artery, which was ligated in the wound. Hæmorrhage did not recur, and the patient was returned to duty on December 7th, 1863. The case is reported by Surgeon I. I. Hayes, U. S. V.

Case.—Corporal A. Talmadge, Co. E, 11th New Jersey Volunteers, aged 32 years, was wounded at the battle of Gettysburg, Pennsylvania, July 3d, 1863, by a conoidal musket ball, which tore the scalp over the left temple for a distance of one by two and a half inches. He was admitted, on July 5th, to Satterlee Hospital, Philadelphia. The wound became gangrenous, and was treated with flaxseed meal and porter poultices. The pain was intense, and the patient was unable to rest; the wound began to slough, and there was such free bleeding, that on July 14th the anterior temporal artery was ligated. The slough was gradually thrown off, and, on July 23d, healthy granulation commenced. A slight hæmorrhage occurred on July 27th, but was speedily arrested by compression. The patient was furloughed on August 1st, 1863, and returned to duty on March 24th, 1864. The case is reported by Surgeon I. I. Hayes, U. S. V.

The following patients recovered, also, from secondary hæmorrhage treated by ligation, and they were discharged on account of the expiration of their terms of service:

Case.—Corporal Henry Kullman, Co. I, 27th Wisconsin Volunteers, aged 25 years, was wounded in an engagement before Petersburg, Virginia, July 30th, 1864, by a conoidal musket ball, which entered anteriorly to the right ear, passed through the pavilion, and emerged just behind the concha. He was at once admitted to the hospital of the First Division, Ninth Corps, and, on August 1st, was sent to the Harewood Hospital, Washington, D. C. On August 14th, hæmorrhage, amounting to four ounces, occurred from the temporal artery, which was ligated in its continuity by Surgeon R. B. Bontecou, U. S. V., a ligature being placed above and below the wound. Hæmorrhage did not recur. On September 3d, 1864, the patient was sent to the Mower Hospital, Philadelphia, and, on May 30th, 1865, was mustered out of service. The case is reported by the operator, Surgeon R. B. Bontecou, U. S. V.

Case.—Private Richard Norris, Co. C, 1st United States Cavalry, aged 32 years, was wounded at the battle of the Wilderness, Virginia, May 8th, 1864, by a conoidal musket ball, which entered in front of the right ear and emerged two inches back of the right mastoid process. He was admitted into Finley Hospital, Washington, D. C., on May 11th, 1864. On May 25th, hæmorrhage occurred from the occipital artery, which was ligated by Acting Assistant Surgeon F. G. H. Bradford. The man recovered, and was discharged on July 20th, 1864, on account of the expiration of term of service. Surgeon G. L. Pancoast, U. S. V., reported the case.

In the following case, recovery ensued after ligation for secondary hæmorrhage, and the patient deserted from hospital:

Case.—Private David Jones, Co. B, 1st Massachusetts Volunteers, aged 26 years, was wounded at the battle of Spottsylvania, Virginia, May 9th, 1864, by a conoidal musket ball, which entered above and to the left of the left eye, passed in a direct line through the integuments over the temporal region, and emerged four inches from the point of entrance. He was conveyed to the Second Division Hospital at Alexandria, and, on May 21st, was transferred to Mower Hospital, Philadelphia. The wound was swollen and painful, and bled freely. On May 24th, the temporal artery was ligated in its continuity, in front of the ear, and half an inch below the wound, by Acting Assistant Surgeon S. D. Marshall. An attack of erysipelas was checked by local applications of iodine and of lead water. The patient recovered, and was, on July 7th, 1864, sent to the hospital at Beverly, New Jersey, whence he deserted on July 23d, 1864.

Two cases of gunshot wound of the scalp, complicated by hæmorrhage, had a fatal termination:

Case.—Private Alexander Brown, Co. B, 14th New York State Militia, aged 33 years, was wounded at the battle of the Wilderness, Virginia, May 8th, 1864, by a conoidal musket ball, which entered in front of the left ear, passed downward and backwards, and emerged about one inch below the occiput. He was admitted into the field hospital of the Fourth Division,

Fifth Army Corps, on the same day, and a few days later sent to Alexandria, and was admitted, on May 12th, to the Second Division Hospital. Simple dressings were used. On May 19th, hæmorrhage took place from the occipital artery, and, though temporarily checked, the arterial bleeding recurred on the 20th, and, on the 21st, about thirty-eight ounces of blood were believed to have been lost altogether. Compression and astringents were the measures unavailingly employed. The patient died on May 21st, 1864. The case is reported by Surgeon T. Rush Spencer, U. S. V.

CASE.—Private Lewis Jones, Co. C, 115th New York Volunteers, aged 23 years, received, in an engagement at Olustee, Florida, February 20th, 1864, a gunshot wound of the scalp. He was conveyed to Jacksonville, and thence to Hilton Head, South Carolina, where he entered the hospital on February 25th. On February 27th, hæmorrhage amounting to six ounces, occurred from the anterior temporal artery. The vessel was ligated, and hæmorrhage did not recur. On April 20th, he was sent to the hospital at Fort Monroe; on April 26th, to the DeCamp Hospital, New York Harbor; and, on September 27th, 1864, to Albany, New York, where he died on October 15th, 1864, from the effects of the wound. Assistant Surgeon M. F. Cogswell, U. S. V., records the case.

Tetanus.—In five of the fatal cases of gunshot wounds of the scalp, tetanus was the cause of death. In every instance, the invasion of this complication was ascribed to exposure to dampness, with sudden depression of the temperature of the atmosphere:

CASE.—Corporal Charles G. Carpenter, Co. F, 19th Iowa Volunteers, aged about 32 years, received a wound of the scalp, in the engagement at Morganzia, Louisiana, September 29th, 1863, by a conoidal ball. He was admitted, from the field, to St. Louis General Hospital, at New Orleans, on October 4th, 1863, where he was treated by application of simple dressings, and the administration of saline catharties, and the free use of morphiæ. On the night of October 7th, the weather became cold and damp, and, on the following morning, the patient manifested symptoms of trismus. The phenomena of acute tetanus rapidly ensued, and the case terminated fatally, on October 11th, 1863. At the autopsy, an extravasation of blood was found beneath the skull, at a point corresponding with the wound of the scalp. The case is reported by Surgeon F. Bacon, U. S. V.

CASE.—Private A. J. Cook, Co. B, 92d Ohio Volunteers, by the accidental discharge of a pistol in his own hands, received, on November 2d, 1862, a slight bullet wound of the integuments of the forehead, over the right superciliary ridge. He was admitted to hospital at Charlestown, Virginia. The wound at first granulated kindly; but, on November 10th, the patient having, in spite of the protestations of his nurse, removed the dressings, and gone out of doors on a cold, damp day, tetanic spasms of great severity set in, and the case terminated fatally within twenty-four hours. Acting Assistant Surgeon McEwen reports the case.

CASE.—Private Wilson Miller, Co. C, 116th United States Colored Troops, aged 26 years, was wounded, in an engagement before Petersburg, April 2d, 1865, by a conoidal ball, which lodged two inches above the left ear. He was taken to the hospital of the Second Division, Twenty-fifth Corps, where the ball was removed. On April 5th, 1865, he was admitted to the hospital at Fort Monroe. He was placed in a hospital tent, and unavoidably exposed to dampness owing to inclement weather. On April 14th, trismus commenced, and spasms gradually extended to the muscles of the chest, abdomen, and extremities. Active purgatives were given until the bowels were thoroughly evacuated, after which opium was prescribed without effect. Subsequently, ether and chloroform were administered, with but temporary benefit; assafœtida also, was ineffectually administered *per anum* in large and repeated doses. Death occurred on April 20th, 1865. Assistant Surgeon E. McClellan, U. S. A., reports the case.

CASE.—Lieutenant Patrick Morris, Co. M, 62d Pennsylvania Volunteers, aged 30 years, received, at the battle of Gettysburg, Pennsylvania, July 2d, 1863, a gunshot scalp wound of the occipital region. On July 3d, he was admitted to the hospital of the Fifth Corps. On July 7th, tetanus, in the form of trismus, made its appearance. Chloroform was administered by inhalation, and free incisions were made through the scalp near the seat of injury. These measures appeared, for a time, greatly to alleviate the symptoms, but after a temporary remission, these recurred with increased severity, and death took place, on July 11th, 1863.

CASE.—Private Thomas J. Severance, Co. F, 2d New Hampshire Volunteers, aged 25 years, was wounded, at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a fragment of shell, which caused a wound of the right side of the scalp, posterior aspect. He was, at first, admitted to the Seminary Hospital, and, on July 8th, was transferred to Turner's Lane Hospital, Philadelphia. The general health of the patient was good. The edges of the wound were inflamed, and cold water dressings were therefore applied, and continued until July 16th, when the patient complained of stiffness of the jaws. The throat was rubbed with strong ammoniacal liniment. On the following day, there was confirmed trismus, and, in addition to this, emprosthotonos occurred during the night. Warm cataplasms were applied to the wound, and anodynes were administered internally. On July 18th, the anodynes were continued, and, as the wound was found to be suppurating freely, a supporting course, consisting of milk punch, and injections of beef tea, was resorted to. On July 19th, the patient appeared to be much the same, manifesting a great indisposition to be disturbed. The treatment of the preceding day was continued, together with the application of powerful rubefacients along the spine. Death resulted on the morning of the 20th of July. The apparent cause of the invasion was damp weather, as it occurred during a very damp, rainy period. The case is recorded by Assistant Surgeon C. H. Alden, U. S. A.

The following case was regarded as an instance of recovery from traumatic tetanus, but the evidence is anything but satisfactory:

Case.—Private Conrad Wentzell, Co. E, 75th Pennsylvania Volunteers, aged 34 years, received, at the battle of Gettysburg, July 1st, 1863, gunshot wounds of the left side of the head and of the upper third of the left arm. He was at once admitted into Seminary Hospital, Gettysburg, and thence, on July 13th, sent to Satterlee Hospital, Philadelphia. There were indications of trismus or tetanus; but upon chloroform being inhaled, no spasms or pain recurred. On the 16th, the patient complained of burning pain in the wound, but on the 25th, he was doing well. The wound looked healthy, and no further complication ensued. He was furloughed on September 23th, 1863, and transferred to Veteran Reserve Corps on February 29th, 1864.

Pyæmia.—The reports specify five cases of gunshot wounds of the scalp in which pyæmia supervened:

Case.—Private *T. D. Biggs,* Co. I, Anthorn's Regiment, was, on July 5th, 1863, admitted to the hospital steamer R. C. Wood, with a gunshot wound of the left side of the scalp. On July 7th, he was transferred to the Overton Hospital, Memphis, Tennessee, and, on July 31st, he was sent to the Church Hospital of the same city, where he died, on September 3d, 1863, of septicæmia, accompanied by embolic obstructions in some of the smaller arteries.

Case.—Private George Gold, Co. I, 155th Pennsylvania Volunteers, aged 23 years, was admitted to Harewood Hospital on October 7th, 1864. He had been wounded at Poplar Grove Church, on September 30th, by a musket ball, which struck the scalp, passing from before backwards, tearing up a portion about three inches in length by one inch in breadth, laying bare the skull and denuding it of its pericranium for the space of three inches in length and one inch in breadth, through the middle of which space the sagittal suture passed, meeting the coronal at the anterior border. The patient was carefully watched for symptoms indicative of cerebral or meningeal inflammation; but none were manifested up to the moment of his death, unless a slight drowsiness, which, at the time, was attributed to the administration of eight grains of Dover's powder, might be so regarded. He was up and about the ward, complaining of nothing except the wound in the scalp, and receiving no treatment, except simple dressings, until the morning of October 18th, when he spoke of a slight pain in the left side of the chest, over the lower lobe of the lung. There was some dullness on percussion over the part complained of, but no marked physical signs of inflammatory mischief. On October 19th, the patient was worse. The pain in the left chest was more severe, resembling that of pleurisy; the pulse was full and frequent; the tongue brown and rather dry; there was very little cough, and no expectoration. On percussion, the right side was very dull over the lower lobe, less so over the upper lobe. The respiratory murmurs were nearly if not quite normal, over the whole of the right lung. Examination by auscultation unsatisfactory, on account of the turbulent action of the heart and the catching character of the respiration. There was no cephalic or nervous symptoms. On October 20th, the patient appeared more comfortable in the early part of the day, the respiration less labored, and pulse more quiet, and tongue more moist; towards the latter part of the day, however, the symptoms increased in severity. Great dullness over whole of left side of chest was noticed, and greatly diminished resonance on the right side. The vesicular murmur was heard over a small portion of the superior lobe of the left lung only. Moist friction sounds over nearly the whole of the left lung could be heard, together with bronchial respiration, and, at some circumscribed parts, a very coarse crepitation. On the right side the vesicular murmur was rather faint, and greatly obscured by bronchial respiration. On October 21st, there was less pain and dyspnœa, very little cough, with a soft infrequent pulse, pale countenance, and increasing dullness on percussion over the right side. Towards the latter part of the day there was less drowsiness. The patient died at half-past eight o'clock, on October 22d, 1864. He was perfectly sensible and rational within ten minutes of his death. A *post mortem* examination was made three hours afterwards. Cadaveric rigidity was strongly marked; the skin of the chest and face was of a deeply jaundiced hue. On making an opening into the chest, about twenty ounces of yellow serum was found in the left pleura, none in the right. The pleural cavities of both sides, but particularly the left, were covered to a considerable extent with coagulable lymph of considerable firmness. The left costal and pulmonary pleural were bound strongly together by broad, thick bands, the result of some former disease. There were also a few much less firm attachments on the right side. The lower lobe of the left lung was in a state of gray hepatization, the upper lobe in that of red hepatization, and in both, at various points, were found circumscribed deposits of pus, containing from one-half a drachm to a drachm each. The lower lobe of the right lung was in a state of red hepatization, and the middle and upper lobes were greatly congested. In the lower lobe were found two or three purulent deposits, which appeared to form centres of inflammation, or metastatic foci. The wound along the scalp appeared as during life. Pus was found along the coronal and sagittal sutures, throughout the whole extent, dissecting the scalp from the bone, to the breadth of one inch. The skull was roughened, and deprived of pericranium to that extent. The portion of the wound which had been originally denuded had begun to exfoliate, a line of separation being visible around it. On removing the calvaria, a thin layer of pus was found between the bone and dura mater, extending along the sagittal and coronal sutures to the same extent as on the external surface, the amount of pus within the skull being less than one drachm. There was a narrow strip of the dura mater each side of these sutures which was inflamed; at other parts this membrane was healthy. The arachnoid and pia mater were perfectly normal. The brain and its ventricles, the cerebellum, medulla oblongata, and roots of all the cerebral nerves, were carefully examined, and no lesions were discovered. The heart and its valves, the vena cava and azygos, the pulmonary veins and arteries, the jugulars, and the blood-vessels of the brain, were in a normal condition. The liver was apparently healthy. Acting Assistant Surgeon Cobb recorded the case.

Case.—Private Rufus Hedges, Co. G, 10th Michigan Volunteers, received, in the engagement at Peach Tree Creek, Georgia, July 21st, 1864, a slight gunshot wound of the scalp. He was admitted into the field hospital of the Second Division, Fourteenth Army Corps, on the same day. On the following day, he was conveyed to Hospital No. 2, at Chattanooga, Tennessee. On August 7th, he was transferred to the Sherman Hospital, at Nashville. A supporting diet was given, and simple dressings used. The patient died, on August 30th, 1864, of pyæmia. Surgeon William Threlkeld, U. S. V., reports the case.

CASE.—Private Gilmer P. Rook, Co. B, 9th Maine Volunteers, aged 18 years, received, at the seige of Petersburg, Virginia, July 8th, 1864, a gunshot wound of the scalp. He was admitted to the hospital of the Second Division, Tenth Corps, and was thence sent to the McDougall Hospital, at Fort Schuyler, where he entered on July 27th. He died, on July 31st, of double pneumonia and icterus, and other signs of pyæmia.

CASE.—Private *A. Russell*, Co. K, 53d North Carolina Regiment, received, at the battle of Gettysburg, Pennsylvania, July 3d, 1863, a gunshot wound of the scalp. He was admitted to the Seminary Hospital, and, on July 17th, was transferred to the De Camp Hospital, at David's Island, New York. Pyæmia supervened, and death occurred on September 20th, 1863. Surgeon Charles Gray, 11th New York Cavalry, reports the case.

Complications from Intercurrent Diseases.—In twelve cases of gunshot wounds of the scalp, the fatal results are ascribed to typhoid fever. This term was often employed in a very loose sense by some of the medical officers, being applied not infrequently to a state of exhaustion resulting from irritative or traumatic fever:

CASE.—Private George W. Beisel, Co. K, 55th Pennsylvania Volunteers, aged 29 years, was wounded, while on picket, May 20th, 1864, by a musket ball, which tore the scalp on the left side. He was admitted, on May 23d, to the hospital at Point Lookout, Maryland, furloughed June 24th, and readmitted on August 17th, 1864. Typhoid fever then set in, and death occurred on October 27th, 1864.

CASE.—Private Charles W. Hapenstall, Co. G, 36th Illinois Volunteers, aged 18 years, was wounded, at the battle of Franklin, Tennessee, November 30th, 1864, by a conoidal ball, which injured the scalp. He was treated in a regimental hospital at first, and transferred, on December 2d, to Hospital No. 19, at Nashville; but, on the same day, he was returned to modified duty, at the Convalescent Camp. On December 4th, he was admitted to the Clay Hospital, Louisville, Kentucky, on account of the same injury. On December 25th, he was transferred to Hospital No. 5, at Quincy, Illinois, where he died, on December 26th, 1864, of "typhoid fever."

CASE.—Private Lewis Hicks, Co. K, 6th New York Heavy Artillery, was wounded, in an engagement before Petersburg Virginia, June 18th, 1864, by a conoidal ball, which struck the left temporal region, inflicting a laceration of the integument. He also received a shell wound of the second finger of the left hand. He was admitted to the hospital of the Second Division, Fifth Corps, where the terminal phalanx was removed. On July 2d, he was sent to the Slough Hospital, Alexandria, Virginia, where cold water dressings were applied to the scalp wound. Death occurred, from enteric fever, on July 10th, 1864. The autopsy revealed the pathognomonic ulceration of Peyer's glands, and extensive inflammation of the intestinal canal.

CASE.—Private *Thomas Jorman*, Co. A, 35th North Carolina Regiment, was admitted to the hospital transport De Molay, with a gunshot wound of the scalp. Typhoid fever supervened, and the patient died, on August 28th, 1864.

CASE.—Private John Leach, Co. I, 11th Iowa Volunteers, aged 26 years, received, at the battle of Shiloh, Tennessee, April 6th, 1862, a gunshot wound of the scalp. He subsequently contracted typhoid fever, from which he died, on May 22d, 1862, at Monterey, Tennessee. Assistant Surgeon A. R. Derby, 20th Missouri Volunteers, reports the case.

CASE.—Private Otis Packard, Co. I, 3d Maine Volunteers, aged 18 years, received, at the battle of Spottsylvania, Virginia, May 12th, 1864, a gunshot wound of the scalp, over the left eye. He was admitted to the hospital of the Third Division, Second Corps, and, on May 14th, sent to the Harewood Hospital, Washington, D. C., where he died, on July 9th, 1864, of "typhoid fever."

CASE.—Private John O'Ragan, Co. C, 1st Maine Infantry, aged 41 years, received, at the battle of Cedar Creek, Virginia, October 19th, 1864, a gunshot wound of the scalp. He was admitted, on the same day, to the hospital of the Second Division, Sixth Corps, and, on October 23d, was sent to the Haddington Hospital, Philadelphia, where he died, "of typhoid fever," December 11th, 1864.

CASE.—Private George A. Raush, Co. B, 108th Illinois Volunteers, received, in the engagement at Arkansas Post, January 11th, 1863, a slight gunshot wound over the eye. He was treated in a field hospital, and, on March 8th, was discharged from the service, on account of chronic diarrhœa and hernia. He died "of typhoid fever," on board of the steamer Nashville, on March 12th, 1863, while in transit for his home.

CASE.—Private Barney Riley, Co. F, 1st New York Dragoons, aged 26 years, was wounded in the engagement at Trevilian Station, Virginia, on June 11th, 1864, by a conoidal musket ball, which caused a wound of the left side of the scalp. He was immediately admitted to the field hospital of the Cavalry Corps, and, on June 21st, he was transferred to Mount Pleasant Hospital, Washington, D. C. Typhoid fever supervened, and the patient died on August 11th, 1864. The case is reported by Assistant Surgeon C. A. McCall, U. S. A.

CASE.—Private Alfred B. Smith, Co. F, 1st Massachusetts Heavy Artillery, aged 26 years, was wounded, in an engagement before Petersburg, Virginia, June 15th, 1864, by a conoidal ball, which lacerated the scalp severely. He was admitted to the hospital of the Third Division, Second Corps, and thence, on July 17th, was sent to the Finley Hospital, Washington, D. C. He died, on July 27th, 1864, "of typhoid fever."

CASE.—Private George F. Stetson, Co. E, 23d Massachusetts Volunteers, aged 23 years, was wounded, at the battle of Cold Harbor, Virginia, June 3d, 1864, by a fragment of shell, which caused a scalp wound of the left side of the head. He was admitted to the field hospital of the Eighteenth Corps, and, on June 9th, sent to the First Division Hospital, at Alexandria. Typhoid fever supervened, and death occurred on July 8th, 1864.

CASE.—Private Charles Tennis, Co. K, 7th Pennsylvania Cavalry, aged 25 years, received, in a skirmish, near Dallas, Georgia, May 27th, 1864, a severe gunshot wound of the left side of the head. He was sent to Kingston, Georgia, and in May sent north. On June 3d, he was admitted to Hospital No. 8, Nashville, Tennessee, and, on June 27th, transferred to the Third Division Hospital, at Murfreesboro, Tennessee, where he died, on September 16th, 1864, of typhoid fever.

In four cases of gunshot wounds of the scalp, the fatal terminations were attributed to incidental malarial attacks. But, as the symptoms were not minutely described, and the necroscopic appearances were not observed, suspicion arises that, in some of the cases at least, the chills may have been symptomatic of internal suppuration, or a part of the characteristic phenomena of pyæmia.

CASE.—Private John A. Boyle, Co. A, 105th Ohio Volunteers, received, in an engagement, near Chattanooga, Tennessee, September 23d, 1863, a gunshot wound of the head. He was admitted to Hospital No. 15, Nashville, where he died, on October 19th, 1863, of typho-malarial fever.

CASE.—Private Daniel Meyers, Co. C, 110th Pennsylvania Volunteers, aged 40 years, received, at the battle of the Wilderness, Virginia, May 5th, 1864, a gunshot wound of the scalp, caused by a fragment of shell. He was, on May 26th, admitted to the Carver Hospital, Washington, D. C., and, on June 2d, transferred to the Hospital at Brattleboro', Vermont. Fever of a malarial character supervened, and death occurred on June 13th, 1864.

CASE.—Private Lewis Price, Co. A, 73d Illinois Volunteers, received, at the battle of Chickamauga, Georgia, September 19th, 1863, a slight gunshot wound of the scalp, over the left eyebrow. He was admitted to the hospital of the Third Division, Twentieth Corps, on September 24th; was sent to an hospital at Nashville, and on February 7th, 1864, was returned to the hospital at Chattanooga, Tennessee, where he died, on March 14th, 1864, of congestive fever.

CASE.—Private Jeremiah R. Putnam, Co. B, 1st Massachusetts Heavy Artillery, aged 42 years, received, in an engagement before Petersburg, Virginia, June 16th, 1864, a gunshot wound of the scalp. A conoidal ball struck over the parietal bones in the line of the sagittal suture. He was admitted to the hospital of the Third Division, Second Corps, and thence sent, by City Point, to the Broad and Cherry Streets Hospital, Philadelphia, which he entered on June 30th. He was, on July 2d, transferred to the Haddington Hospital. When admitted the patient suffered from intermittent fever and chronic diarrhœa, and was extremely anæmic and emaciated. He died, on July 7th, 1864, "undoubtedly in consequence of serous effusion in brain, causing general paralysis."

In thirteen cases of gunshot wounds of the scalp, pneumonia is reported as the cause of death; but, in several of them, it is questionable if the pulmonary complications were not embolic phenomena, indicating the formation of metastatic foci, and whether these cases would not have been more properly classified under the head of pyæmia:

CASE.—Private Benjamin D. Cargill, 2d Vermont Volunteers, aged 19 years, received, at the battle of Spottsylvania Court House, Virginia, May 8th, 1864, a gunshot wound of the anterior portion of the scalp. He was admitted to the hospital of the Second Division, Sixth Corps, and, on May 26th, sent to the Lincoln Hospital, Washingfon, D. C. Furloughed on May 24th, he was readmitted on June 23d, and died on August 8th, 1864, of acute bronchitis.

CASE.—Private James R. Coulter, Co. E, 95th Ohio Volunteers, aged 38 years, received, during the siege of Vicksburg, Mississippi, June 20th, 1863, a gunshot wound of the scalp, right side, and also a flesh wound of the right forearm. He was admitted to the hospital of the Third Division, Fifteenth Corps, where he is reported as recovered for duty. On November 5th, 1864, he was admitted to the Adams Hospital, Memphis, Tennessee, with pneumonia, and died on November 9th, 1864.

CASE.—Sergeant Richard Decker, Co. K, 1st New Jersey Cavalry, aged 22 years, received, at the affair at Salem Church, Virginia, May 28th, 1864, a wound from a conoidal musket ball, which tore up the scalp over the vertex for the length of an inch. No injury to the bone could be detected. The patient was sent to Washington, and admitted to Mount Pleasant Hospital on June 4th, 1864. Pneumonic complications supervened, and the patient sank into a typhoid condition, which terminated fatally on June 11th, 1864. Assistant Surgeon H. Allen, U. S. A., recorded the case.

CASE.—Private Samuel Healey, Co. C, 25th Massachusetts Volunteers, aged 28 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a fragment of shell, which caused a wound of the scalp. He was at once admitted to the hospital of the Eighteenth Corps, on June 7th transferred to the Second Division Hospital at Alexandria, and, on June 12th, sent to the hospital at Chester, Pennsylvania. Warm applications were made to the wound to promote discharge, but on the 19th pleuro-pneumonia set in, and death occurred on June 23d, 1864. Surgeon E. Bentley, U. S. V., records the case.

CASE.—Private John A. Huff, Co. E, 5th Michigan Cavalry, aged 48 years, received, in an engagement near Cold Harbor, Virginia, May 28th, 1864, a severe gunshot wound of the scalp from a conoidal ball. He was admitted to the Cavalry Corps Hospital, and, on June 3d, sent to the Campbell Hospital, Washington, D. C., whence he was furloughed on June 17th, 1864. He died while on furlough, June 23d, 1864, from wound and pneumonia. Surgeon A. F. Sheldon, U. S. V., records the case.

CASE.—Private C. W. Johnson, Co. I, 31st Maine Volunteers, aged 25 years, received, at Spottsylvania Court House, Virginia, May 12th, 1864, a shell wound of the scalp. He was admitted to Harewood Hospital, Washington, on May 16th, transferred to Patterson Park, Baltimore, May 18th, thence to David's Island, New York Harbor, May 24th, and, finally, to Cony Hospital at Augusta, Maine, on June 3d, where pneumonia supervened, and the patient died, on June 11th, 1864.

CASE—Private Allen H. Moore, Co. E, 1st Ohio Volunteers, aged 26 years, received, in an engagement near Dallas, Georgia, May 27th, 1864, a gunshot scalp wound of the left side of the head. He was admitted to the hospital of the Third Division, Fourth Corps, and, on June 1st, was sent to the Cumberland Hospital, Nashville, Tennessee, where he died, on June 15th, 1864, of typhoid pneumonia. Assistant Surgeon W. B. Trull, U. S. V., records the case.

CASE.—Private John Porter, Co. D, 35th Indiana Volunteers, aged 32 years, received, in an engagement at Marietta, Georgia, June 18th, 1864, a gunshot wound of the scalp. He was admitted to the hospital of the First Division, Fourth Corps, and, on June 23d, he was transferred to Hospital No. 2, Chattanooga, and, on June 30th, thence sent to the Cumberland Hospital, Nashville, Tennessee. Simple dressings were applied to the wound, but the patient was attacked by pleuro-pneumonia, and died on July 13th, 1864. Assistant Surgeon W. B. Trull, U. S. V., records the case.

CASE.—Private James Reardon, Co. B, 6th Missouri Volunteers, received, before Vicksburg, Mississippi, in the latter part of December, 1862, a scalp wound. He was taken on board the Steamer City of Memphis, and, on January 13th, 1863, was admitted to the hospital at Paducah, Kentucky, where he died of wound of scalp, with pneumonia, on January 18th, 1863.

CASE.—Captain F. W. Sabine, Co. G, 11th Maine Volunteers, aged 25 years, received, in an engagement at Deep Bottom, Virginia, August 14th, 1864, a gunshot wound of the scalp. He was, on the following day, admitted to the Chesapeake Hospital, at Fort Monroe, Virginia. Pneumonia of the right lung existed at time of admission, and terminated fatally on September 15th, 1864. Assistant Surgeon E. McClellan, U. S. A., records the case.

CASE.—Private James Shields, Co. I, 69th New York Volunteers, received, at the battle of Fredericksburg, Virginia, December 13th, 1862, a gunshot wound of the scalp. He was admitted to the hospital of the Third Division, Ninth Corps, on December 14th, was sent to the Armory Square Hospital, Washington, D. C., and, on December 19th, transferred to the De Camp Hospital, New York Harbor, where he died, on January 9th, 1863, of pneumonia. Surgeon T. Simons, U. S. A., recorded the case.

CASE.—Private George M. Snow, Co. D, 25th Wisconsin Volunteers, aged 23 years, received, at the battle of Resaca, Georgia, May 14th, 1864, a shell wound of the scalp. He was, at once, admitted to the hospital of the Sixteenth Corps. On May 19th, he was sent to the field hospital at Chattanooga, on May 21st, was transferred to Hospital No. 1, Nashville, and thence, on May 24th, was sent to the Brown Hospital, Louisville, Kentucky. He died, on June 9th, 1864, of pleuro-pneumonia.

CASE.—Private William Spencer, Co. F, 51st Ohio Volunteers, received, at the battle of Kenesaw Mountain, June 22d, 1864, a shell wound of the scalp. He was conveyed to Nashville, Tennessee, and admitted to the Cumberland Hospital, on June 26th. Typhoid pneumonia supervened, and the patient died, on July 3d, 1864.

Three fatal cases of gunshot scalp wounds were complicated by the supervention of variola:

CASE.—Corporal Edgar Calkins, Co. D, 5th Michigan Volunteers, received, at the battle of Fredericksburg, Virginia, December 13th, 1862, a gunshot wound of the right side of the scalp. He was admitted to the hospital of the First Division, Third Corps, and, on December 19th, was sent to Mansion House Hospital, Alexandria, and, on April 10th, 1863, symptoms of small-pox being manifested, he was transferred to hospital for eruptive diseases, at Kalorama, Washington, D. C., where he died, on May 27th, 1863, of varioloid with cerebral symptoms.

CASE.—Private John Crandall, Co. K, 64th New York Volunteers, aged 33 years, received, at the engagement at North Anna, Virginia, May 18th, 1864, a scalp wound of the occipital region, from a musket ball. He was sent to Washington, and entered Carver Hospital on the 24th, and, on the 27th, was transferred to the Summit House Hospital, Philadelphia. Here he had variola. When partially convalescent he was removed, July 14th, to Turner's Lane Hospital; again, on October 10th, to Filbert Street Hospital, and again, on February 16th, 1865, to Islington Lane Hospital. Here he died, on February 24th, from the effects of the wound, and of the sequelæ of small pox.

CASE.—Sergeant Charles Harbstrutt, Co. D, 74th Pennsylvania Volunteers, received, at the battle of Gettysburg, July 2d, 1863, a shell wound of the integuments on the back of the head. He was admitted, on the same day, to the Seminary Hospital, at Gettysburg, to be transferred on the 18th, to the hospital at York, Pennsylvania. On October 8th, variola supervened, and the patient died, November 6th, 1863, from the conjoined effects of the wound and fever.

In one case of gunshot scalp wound hepatitis is adduced as the cause of death:

CASE.—Private Edward McDole, Co. G, 7th New York Heavy Artillery, received, in an engagement before Petersburg, Virginia, June 16th, 1864, a scalp wound, caused by a fragment of shell. He was admitted to the hospital of the First Division, Second Army Corps; on June 21st, he was sent to the Lincoln Hospital, Washington, D. C., and, on June 28th, to the Satterlee Hospital, Philadelphia, where he died, on July 9th, 1864, "of hepatitis."

Diarrhœa is reported as a fatal complication in four cases:

CASE.—Private Joseph Coad, Co. F, 3d Maine Volunteers, aged 35 years, was wounded, at the battle of the Wilderness, Virginia, May 8th, 1864, by a conoidal ball, which lacerated the right side of the scalp. He was sent to Washington, and admitted, on May 27th, to Carver Hospital, where simple dressings were applied to the wound. Death occurred on June 18th, 1864, from "chronic diarrhœa." Surgeon O. A. Judson, U. S. V., recorded the case.

CASE.—Private A. F. Dana, Co. E, United States Marine Corps, aged 22 years, was wounded, at the assault on Fort Fisher, January 15th, 1865, by a fragment of shell, which lacerated the right side of the scalp and caused a transitory concussion of the brain. He was made a prisoner, but was shortly afterwards exchanged, and, on February 3d, 1865, admitted to the hospital at Point Lookout, Maryland. Here he died, on July 18th, 1865, of "chronic diarrhœa." Surgeon G. L. Sutton, U. S. V., records the case.

CASE.—Private Alvah B. Small, Co. C, 20th Maine Volunteers, received, at Gettysburg, Pennsylvania, July 3d, 1863, a gunshot wound of the scalp. He was, at once, admitted to a field hospital, and, on July 8th, was transferred to the Satterlee Hospital, at Philadelphia. Simple dressings were applied to the wound, and tonics and astringents were administered internally. Chronic diarrhœa, from which he was suffering, persisted, and death ensued August 28th, 1863.

CASE.—Corporal Richard H. Van Devine, Co. K, 1st New Jersey Infantry, aged 28 years, received, at the battle of Spottsylvania, Virginia, May 12th, 1864, a gunshot wound of the scalp He was admitted, on June 11th, to the Mount Pleasant Hospital, Washington, D. C., and, on June 20th, transferred to the Summit House Hospital, Philadelphia. At the period of his admission he was very much reduced, and he died, on July 10th, 1864, "of diarrhœa." Surgeon J. H. Taylor, U. S. V., records the case.

Privation in prison is assigned as the cause of death in one case:

CASE.—Private John A. Brown, Co. B, 73d Illinois Volunteers, was wounded, at the battle of Chickamauga, September 19th, 1863, by a musket ball, which produced a lacerated wound of the scalp. He was made a prisoner, and was sent to Andersonville, Georgia, where he died, on August 17th, 1864.

The following case terminated fatally in consequence of the supervention of diphtheritis:

CASE.—Private Julius McKnight, Co. D, 27th U. S. Colored Troops, aged 23 years, received, on July 30th, 1864, at the siege of Petersburg, Virginia, a gunshot wound of the scalp. He was sent to the hospital for Colored Troops, a few miles in the rear, at City Point. Here little importance was attached to the wound of the head, and the patient was entered on the register as suffering from remittent fever. On August 14th, he was sent to Philadelphia, to the Summit House Hospital, where the scalp wound was regarded as serious. As it was progressing favorably, light, simple dressings were applied. In September, symptoms of diphtheria were manifested, and the disease making very rapid progress, the patient died, on September 20th, 1864. At the autopsy, the mucous coat of the fauces and trachea appeared to be ulcerated and disorganized. A tough tubular membrane lined the larynx, trachea, and bronchi, even to the smaller ramifications; and in the larger air passages, this pseudo-membrane was detached. It was of a yellowish gray or ash colored hue. The lungs were much engorged. An abscess containing half an ounce of pus was found in the right lung. Entangled among the columnæ carneæ of the right ventricle of the heart was a concretion, half an ounce in weight, very similar in appearance to the membranous exudation in the lung. It was very unlike the ordinary fibrinous coagula or heart clots so frequently observed in autopsies, and, under the microscope, presented the same histological elements as the exudations in the air passages. Surgeon J. H. Taylor, U. S. V., records the case.

In another of the one hundred and sixty-two fatal gunshot scalp wounds, the fatal result was probably due to *delirium tremens:*

CASE.—Corporal William Quinn, Co. A, 95th New York Volunteers, aged 29 years, received, at the battle of Gettysburg, July 2d, 1863, a gunshot scalp wound of the frontal region. After a few days treatment in field hospital, he was sent to Philadelphia, and admitted into Satterlee Hospital on July 11th. He died "from *mania à potû*" on August 23d, 1863. At the autopsy, an extensive discoloration of the forehead and face was observed; but no fracture of the cranium or injury of the brain could be detected after most careful exploration. There was cirrhosis of the liver; but the other viscera showed no organic alteration. Surgeon I. I. Hayes, U. S. V., records the case.

The five following cases are reported as slight gunshot wounds of the head. From the evidence derived from prescription books, hospital registers, monthly reports, and other sources, it is inferred that the injuries were diagnosticated as gunshot wounds of the scalp only, and that no lesions of the bony walls of the skull were discovered after death:

CASE.—Corporal Isaac Foster, Co. H, 98th New York Volunteers, aged 23 years, received, at the battle of Cold Harbor, Virginia, June 3d, 1864, a gunshot wound of the head. He was admitted to the hospital of the First Division, Eighteenth Corps, and was thence transferred to hospital Division, No. 2, Alexandria, Virginia, where he died, on June 21st, 1864, from wound. Surgeon E. Bentley, U. S. V., records the case

CASE.—Corporal Henry French, Co. I, 173d New York Volunteers, received, on May 12th, 1863, a gunshot wound of the head. He was admitted to the Alexander Hospital, Brashear City, Louisiana, where he died, on May 25th, 1863. Surgeon C. Powers, 160th N. Y. Vols., reports the case.

CASE.—Private *W. R. Griffith*, Co. H, 20th Virginia Regiment, was brought to the Chimborazo Hospital, Richmond, Virginia, on December 10th, 1864, with a gunshot wound of the head. He died on December 25th, 1864. Assistant Surgeon J. B. Wily, C. S. A., records the case.

CASE.—Private Charles Russell, Co. B, 37th Massachusetts Volunteers, was wounded at the battle of Winchester, September 19th, 1864, and is reported by Assistant Surgeon Elisha M. White, 37th Massachusetts Volunteers, as "killed in battle." He was not killed, however, but was conveyed to the general field hospital of the Sixth Corps, whence the case is reported by Surgeon S. A. Holman, U. S. V., as a flesh wound of the scalp, produced by a fragment of shell. On October 4th, the patient was transferred to Sheridan Hospital, where the diagnosis is recorded by Surgeon F. V. Hayden, U. S. V., as a gunshot wound of the scalp, involving the integument only, and by Surgeon W. A. Barry, 98th Pennsylvania Volunteers, as a gunshot wound of the head with injury of the skull. The patient died on October 7th, 1864.

CASE.—Private Edward Wilmore, Co. K, 1st Missouri Volunteers, received, at the battle of Wilson's Creek, Missouri, August 10th, 1861, a gunshot wound of the head and the face. He was, on the same day, admitted to the hospital at Springfield, where he died, on August 25th, 1861.

As contused or lacerated wounds of the scalp are rarely fatal, unless followed by secondary disease of the cranium or its contents, or by hæmorrhage, sloughing, pyæmia, or tetanus, numerical estimates of the results of gunshot injuries of the integuments of the head can teach us little more than the relative frequency and fatality of such complications. The foregoing brief abstracts of two hundred cases include thirty-eight recoveries and one hundred and sixty-two fatal cases. The tabular statement, on page 70, of 7,739 cases of gunshot scalp wounds gives a near approximation to the truth regarding the results of such injuries, every allowance being made for errors in diagnosis and imperfection in the returns.* The histories of 3,420 cases have been traced from hospital to hospital until the complete recovery of the patients and their return to duty was ascertained. In like manner, the histories of 132 Confederates who recovered and were exchanged, released, or paroled, and of 127 United States enlisted men who were sent to modified duty, have been followed to their termination. The terminations of 1,186 cases in resignation, discharge, dismissal, failure to return from leave or furlough, or in desertion, have been ascertained. 1,609 patients have been followed through successive transfers to hospitals or convalescent camps; though the records do not furnish evidence of the ultimate disposition made of them, it may be inferred that they recovered, since their names do not appear upon the alphabetical registers of deaths. Finally, 1,103 cases are derived from the field casualty lists, and, although they are entered as cases in which the terminations are "unknown," it may be inferred, as the names do not reappear on any of the hospital registers, that the injuries in these cases were slight, and that the patients were returned to duty almost immediately. Grouping those sent to active or modified duty, those transferred, paroled, or exchanged, and those who did not enter permanent hospitals, in one class, and in another those who were discharged, or dismissed, or reported as deserters, the 7,739 cases are accounted for as follows: 162 patients died, 1,186 were discharged, and 6,391 recovered. But, as 1,186 patients discharged include many who were mustered out on the expiration of their term of service, or who failed to return from furlough, or who deserted, a nearer approximation to exact truth is attained by the statement that 162 died, 522 were discharged on certificates of physical disability, and 7,055 probably recovered. The death-rate of gunshot wounds of the integuments of the cranium during the late war was, therefore, about 2.09, or nearly one fatal case in 48.

* I am anxious to point out how far each numerical estimate may be relied upon, and to indicate the sources of error. The reports of each of the seventy-seven hundred and thirty-nine cases of gunshot wounds of the scalp recorded in TABLE III, were separately examined and were entered upon the register of gunshot wounds of the scalp, when the evidence indicated the probability that the injury was limited to the integument. The tabular statement is a correct transcript from the official records, and an index of the average results of the injuries to which it relates. To suppose that no cases of contusion of the skull or injury to the brain were included in the statement, would imply a precision in diagnosis and perfection in returns that are unattainable. In a final revision of the reports, I have set aside twenty-one cases, including eleven that were fatal, recorded among the scalp wounds as probably examples of contusion of bone, and have transposed about an equal number from the register of contusions and partial fractures of the skull.

The Surgical History of the British Army in the Crimea, compiled by Staff Surgeon T. P. Matthew,* contains a record of 668 gunshot wounds of the head designated "simple flesh contusions and wounds;" 8 of these patients died, 73 were invalided, and 587 were returned to duty, a mortality-rate of 1.02, or one in 83. The surgical report of the French army in the Crimea, by M. Chenu,† presents a tabular statement of 1,633 gunshot wounds of the head distinguished from fractures of the cranium and wounds of an undetermined nature, and designated "plaies simples et contusions." Of these patients, 157 died, 17 were pensioned, and 1,459 returned to duty; a death-rate of nearly ten per cent. In the Report on the Italian War of 1859, the same author‡ enumerates 308 cases of gunshot wounds of the head as "contusions et plaies contuses." Of these patients 19 died, 4 were invalided, and 285 returned to duty, or about one death in 16. These discrepancies are quite explicable. M. Chenu's returns are very incomplete, the slight cases being omitted. The British returns include contusions by spent balls and trivial injuries; but exclude fatal results from intercurrent diseases. The American returns comprise a large series of both slight and severe cases, and include the fatal results due to diseases contracted in hospitals.

The danger of injuries of the skull varies greatly, according to the part involved; but in wounds limited to the integument little difference is observed, save that those of the temporal and occipital regions are more liable to hæmorrhage. In 5,246 cases of gunshot wounds of the scalp, the precise location of the wound is not specified. In the remaining 2,493 cases the seat of injury is reported as follows:

TABLE IV.

Seat of Injury in Two Thousand Four Hundred and Ninety-three Cases of Gunshot Wounds of the Scalp.

REGIONS.	Cases.	Died.	Disch'd.	Duty.	Unkn'n.	Per cent. of death.
Frontal	573	18	117	239	199	4.8
Parietal	1,234	37	237	586	374	4.3
Temporal	416	9	80	192	135	3.2
Occipital	270	11	46	133	80	5.7
TOTAL	2,493	75	480	1,150	788	4.4

The gunshot wounds of the scalp presented many varieties. There were mere scratches of the skin made by the sharp angles of shell fragments, solutions of continuity resembling incised wounds superficial injuries analogous to ordinary contusions with abrasion of the cuticle furrows or cleanly cut grooves made by balls moving with great velocity, lacerations with flaps or with much loss of tissue, long fistulous tracks or tunnel-like passages styled by French surgeons *plaies en séton*, and wounds with lodgement of the missile.

* Medical and Surgical History of the British Army which served in Turkey and the Crimea during the War against Russia, in the years 1854–'55–'56, London, 1858, Vol. II, p. 286.

† *Rapport au Conseil de Santé des Armées sur les Résultats du Service Médico-Chirurgical pendant la Campagne d'Orient en* 1854–'55–'56. Par J. C. CHENU, Paris, 1865, p. 134.

‡ *Statistique Médico-Chirurgicale de la Campagne d'Italie en* 1859 *et* 1860. Par J. C. CHENU, Paris, 1869, Tome II, p. 424.

The abrasions and superficial cuts require no other comment than the Hippocratic aphorism, that no injury of the head is too slight to be despised; the furrowed wounds, because of the rounded form of the head, are usually very limited in length; the extended lacerations are commonly produced by shell fragments or by elongated musket balls striking sideways; long fistulous tracks are made by both round and cylindro-conical small-arm projectiles deflected by the dense tissues of the scalp, but the longest occur when a round ball strikes obliquely and runs around the head, such cases being rare unless attended by contusions of bone; the wounds resembling incisions are not exempt from slight loss of tissue and consequent inevitable suppuration. The wounds with lodgement of missiles will be noticed presently, after adverting to the relative frequency of wounds from the different varieties of gunshot projectiles.

In the returns of 4,002 cases, the nature of the gunshot projectile inflicting the injury is specified in the reports, and in 3,737 cases this particular is not referred to, or was undetermined:

TABLE V.

Nature of Missile in Four Thousand and Two Cases of Gunshot Wounds of the Scalp.

NAME OF MISSILE.	No. of Wounds.
Conoidal Musket Ball	2,612
Round Musket Ball	384
Explosive Musket Ball	2
Buck Shot	94
Pistol Ball	25
Solid Cannon Ball	3
Shell Fragments	861
Grape Shot	9
Case and Canister Shot and Shrapnel	6
Torpedo Fragments	4
Piece of Iron	2
TOTAL	4,002

This statement indicates that 72.6 per cent., or nearly three-fourths of the gunshot wounds of the scalp, were caused by small-arm missiles, and that, without any attendant injury to the skull or concussion of the brain, the scalp may be wounded by the largest projectiles from artillery. The form, size, and velocity of missiles have very important relations to the nature and extent of fractures, wounds of the great cavities, and some classes of flesh wounds; but the soft parts covering the skull are so thin, that distinctions referable to the nature of the projectiles causing flesh wounds of this region are not well marked, and suggest few considerations of interest. The varieties in gunshot scalp wounds depends more upon the velocity than the dimensions or shape of the missile. Cleanly cut furrows were made both by musket balls and fragments of shell in rapid flight, and very ragged wounds were inflicted not only by shell fragments, but by nearly spent or glancing musket balls.

In sixty-five cases, or less than one per cent. of the gunshot wounds of the scalp, foreign bodies lodged, and were extracted from beneath the integument. They were chiefly small-arm projectiles, either nearly spent or diminished in velocity by deflection that made no exit wounds; but small fragments of shells, iron balls from spherical case, and buttons and bits of metal, torn from the soldier's uniform or equipment, were occasionally extracted. A few illustrative cases will not be uninteresting:

CASE.—Private Diedrich Dasenbuck, Co. C, 151st Pennsylvania Volunteers, was wounded, at the battle of Gettysburg, July 1st, 1863, by a battered conoidal musket ball, which struck the scalp an inch and a half behind the right ear, and, passing forward beneath the integument, lodged in the right cheek. He received another wound, the entrance being on the right side of the neck, at the border of the trapezius, two inches within and above the acromio-clavicular articulation, the missile passing subcutaneously and lodging above the middle of the right clavicle, whence it was removed through a button-hole incision, on July 3d. He was treated for a few days in the Seminary field hospital, at Gettysburg, Pennsylvania, and was then sent to Philadelphia, and admitted, on July 11th, to the hospital in Turner's Lane. On July 17th, the position of the larger foreign body was ascertained, and it was removed from the cheek, by an incision through the inner or buccal surface, from its lodgement immediately below the orifice of the duct of Steno. Both wounds cicatrized promptly, and the patient was returned to duty perfectly well, on August 17th, 1863. The ball removed from the cheek was very much battered, and included in its folds a tuft of hair. The other missile extracted was a flattened piece of lead, not improbably a fragment of the projectile just described. This, a cylindro-conical ball of English manufacture, had apparently struck and split upon some hard surface before inflicting the wound in the scalp. The two projectiles were contributed to the Army Medical Museum by Acting Assistant Surgeon Charles Carter, and are represented in the adjacent wood-cut, (FIG. 27). The notes of the case were furnished by Assistant Surgeon C. H. Alden, U. S. A.

FIG. 27.—Projectiles extracted from a patient with a wound of the scalp.—*Spec.* 4526 and *Spec.* 4527, Sect. I, A. M. M.

A ball lodged under the scalp is, usually, very readily detected; but, in rare instances of lodgement in the temporal fossa or occipital region, there may be some obscurity. The next abstract suggests the utility, in such cases, of the probe invented by M. Nélaton:

FIG. 28.—Elongated ball extracted from beneath the occipital region of the scalp.—*Spec.* 3153, Sect. 1, A. M. M.

CASE.—A soldier of the First Brigade, First Division, Fifth Corps, was wounded, on May 20th, 1864, in the advance from Spottsylvania towards the North Anna river, by a musket ball, which entered the left cheek over the canine fossa of the left superior maxillary, and passed outward and backward eight inches, without apparent injury to the bone, and lodged under the scalp above the nucha. The discoloration of the porcelain tip of a Nélaton probe passed through the long fistulous track, revealed the exact location of the ball, which was immediately extracted, on the field, by Surgeon T. M. Flandrau, 146th New York Volunteers. The notes of the case, together with the specimen, represented in the wood-cut (FIG. 28), were forwarded by Assistant Surgeon J. Sim Smith, U. S Army. In a letter from Dr. Flandrau, dated Rome, New York, February, 1870, he refers to this case, and mentions that, "in a careful examination of the wound, several surgeons were unable to decide whether bone or ball was touched, until the porcelain-tipped probe promptly settled the question."

Very rarely a fragment of shell may lodge under the scalp without injuring the bone, as in the following instance:

CASE.—Private G———, Co. F, 41st New York Volunteers, in the assault on the works on St. John's Island, South Carolina, February 11th, 1864, was wounded in the right temple. He walked from the battle-field to the field hospital, several hundred yards in the rear, and presented himself to Surgeon Samuel Brillantowski, of his regiment. A crucial wound was found in the temporal region, three-fourths of an inch from the external angle of the right orbit. An irregularly triangular fragment of a shell was found beneath the integument, and was speedily extracted. Under appropriate treatment the wound healed perfectly in six weeks, the patient recovering without any impairment of vision. The specimen, contributed by Surgeon Brillantowski to the Museum, with the foregoing notes, is represented in the adjacent wood-cut. (FIG. 29.)

FIG. 29.—Small cast-iron fragment, apparently from the base of a cylindrical shell.—*Spec.* 2345, Sect. I, A. M. M.

Brevet Lieutenant Colonel C. H. Laub, Surgeon U. S. Army, lately informed the writer that, during the hostilities with the Seminoles in Florida, the lodgement of small rifle balls under the scalp was not an infrequent occurrence. Surgeon Laub cited three instances of removal of such missiles from beneath the frontal integument, in the cases of soldiers wounded near Fort Miller. The short incisions necessary for the removal of the balls healed within two weeks, and there were no unpleasant consequences.

Gunshot contusions of the head without breach of surface, of sufficient severity to cause ecchymosis, were invariably attended by commotion, concussion, or intracranial extravasation, and are classified, and will be described, in connection with injuries of the encephalon.

Among the cases reported as gunshot wounds of the scalp, were many followed by vertigo, headache, persistent pain at the point struck, impairment of the special senses—amaurosis and deafness being especially frequent—by mental imbecility, by epilepsy, and various forms of paralysis; but, as in all of these cases the ulterior effects indicated that there must have been some injury to the cranium or its contents, they were nearly all excluded from the return on page 70, and will be considered in the next subsection.

It has not been practicable to ascertain the nature of the disabilities for which one hundred and twenty-seven enlisted men were transferred to the Veteran Reserve Corps, after receiving gunshot wounds of the scalp. The reports to this Office afford no information on the subject. The surgeons' certificates, under which the men were transferred, were forwarded to the Provost Marshal General, and duplicates were sent to the Adjutant General; but these certificates only state the seat of injury, without detailing its consequences, and the degree of disability, without specifying its nature.

A critical examination of the returns constrains me to disagree with Neudörfer,[1] Denonvilliers,[2] and other modern authorities, in regard to the comparative infrequency of gunshot wounds limited to the integuments of the cranium. In gunshot wounds of the head, the fractures and penetrating and perforating wounds of the brain undoubtedly exceed in number the lesions of the exterior soft parts; but so many of the wounded of the first class are left dead on the field, that it may be safely asserted that of the cases brought under surgical treatment, the scalp wounds are more numerous than the fractures.

The return, on page 70, of 7,739 cases of gunshot wounds of the scalp, unquestionably includes some instances complicated by injury to the skull or its contents; as, for example, the case of Corporal Carpenter, of which an abstract is given on page 83. But such examples are few, so that in a final revision of the registers of gunshot injuries of the head, made since the preceding pages were printed, I have found but twenty-one cases in which the evidence furnished by the reports indicated the probability of any lesion of the cranium or brain. There is great difficulty, no doubt, in distinguishing the various classes of gunshot wounds of the head, both in practice, and in the analysis of brief and often imperfect reports. But, from the evidence offered, it would appear incontestable, that in the cases of gunshot injuries of this region which come under the care of the surgeon, the wounds of the soft parts outnumber the fractures.

The divisions here established in classifying gunshot wounds of the head, are, of course, in a measure, arbitrary and artificial, and are only justified by the necessities of analysis and of study. For these purposes, it is requisite to separate these lesions, and to present particular descriptions of each; but the practical surgeon will never lose sight of the fact that, in examining patients, he will constantly encounter complications of disorders of every variety.

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[1] Neudörfer. "Im Kriege kommen derlei Verletzungen der Schädelbedeckungen viel seltener vor, als man glauben sollte, weil die meisten Schussverletzungen des Kopfes sich nur äusserst selten auf die Weichtheile beschränken," u. s. w., in *Handbuch der Kriegschirurgie*, Leipzig, 1867. Zweite Hälfte, Erstes Heft, S. 6.

[2] Denonvilliers et Gosselin. "Rarement les coups de feu bornent leur action aux parties molles." *Compendium de Chirurgie Pratique*, Art. *Lésions Traumatiques du Crane*, T. II, p. 570, Paris, 1851.

In discussing, on page 89, the ratio of fatality of gunshot wounds of the scalp, deaths from intercurrent diseases have been included in the estimates, in conformity with the system of reports in the medical department of the United States Army. In one hundred and twenty-two of the one hundred and sixty-two fatal cases, death would appear, beyond question, to have resulted, either directly or indirectly, from the effects of the wound; some form of encephalitis being the proximate cause in ninety-eight cases, and such complications as erysipelas, gangrene, hæmorrhage, tetanus, and pyæmia, in twenty-four cases. The remaining forty fatal cases include twenty-nine deaths, attributed to typhoid and malarial fevers, and pneumonia, in regard to which it is difficult to determine how far the febrile or pulmonary symptoms were symptomatic only, and eleven deaths, due to variola, diphtheritis, hepatitis, privation, and *delirium tremens*, the original injury having little, if any connection with the fatal event The duration of life after the reception of the injury, of the one hundred and sixty-two fatal cases, taking an average from them all, was forty days. The mean interval in the cases in which the fatal terminations were due to encephalitis, was twenty-four days. Some of the patients who succumbed to secondary diseases less directly dependent on the injuries received, survived many months.

As other examples of the more common complications of gunshot wounds of the scalp, as hæmorrhage, erysipelas, sloughing, and abscess, will be offered in the next subsection, it will be more convenient to defer the consideration of these subjects. Some observations on cerebral irritation and on traumatic encephalitis will be presented at the close of the chapter. Remarks upon the cases of tetanus and pyæmia will more appropriately find a place in the chapters specially devoted to the discussion of those important affections.

The Army Medical Museum has but a single anatomical preparation[1] illustrating gunshot wounds of the scalp; but possesses a large collection of photographs of patients with such injuries.[2] The majority of cases selected for illustration were severe lacerations, or were complicated by erysipelas, or sloughing, or injury to the skull. Four of these photographs are faithfully copied in Plate III.

The ordinary primary treatment of gunshot wounds limited to the scalp, consisted in washing the parts with a warm sponge, shaving the scalp in the vicinity of the wound, removing foreign bodies, and suppressing hæmorrhage, when necessary, and covering the part with a compress dipped in cold water. Many, perhaps the majority, of the surgeons were accustomed to approximate the edges of the wounds by adhesive strips, and a few even used stitches. It is hardly possible that they anticipated union by first intention; but they probably hoped to abbreviate the stage of granulation by these methods of dressing. Other surgeons applied, in place of water dressings, a strip of muslin or lint spread with simple cerate, and kept in place by adhesive plaster, and thus avoided the

[1] *Specimen* 1302, Section I.—A wet preparation of a portion of the scalp from the right parietal region, perforated by a musket ball which fractured the cranium. The opening made by the ball has been enlarged by two incisions and by the sloughing of the contused edges. Sergeant J. F——, Co. K, 14th Maine Volunteers, aged 34 years, wounded at Port Hudson, Louisiana, May 27th, admitted into hospital at New Orleans, 29th May; died, June 7th, 1863. The specimen was contributed by Assistant Surgeon P. S. Conner, U. S. Army. See *Catalogue of the Surgical Section of the Army Medical Museum*, p. 38.

[2] See CARD PHOTOGRAPHS, A. M. M., Vol. III, p. 1., (Case of Sergeant Coletrap;) Vol. III, p. 3, (Case of Private Folsom)—for illustrations of lacerations of the integuments of frontal and parietal regions, without injury to the skull. See PHOTOGRAPHS OF SURGICAL CASES, Vol. III, p. 7, (Case of Ferris,) p. 9, (Case of Van Valkenberg,) p. 10, (Case of Shaffer,) Vol. VII, p. 1, (Case of Wheeler,) p. 3, (Case of Scott,) p. 4, (Case of Schiller,) p. 5, (Case of Bean,) p. 7, (Case of Kinchelow,) p. 9, (Case of Henderson), Vol. I, p. 33, (Case of Dougherty)—for a few of the many illustrations of complicated gunshot injuries of the scalp.

necessity of a retentive bandage. It was not customary to lay open the long fistulous wounds where there was an aperture of exit; but injections were used to cleanse them from the hairs, bits of clothing, or other foreign bodies that might have lodged in the sinuses. The blind fistulous wounds with a missile at the closed end, were treated by a counter-opening for the extraction of the foreign body, and were thus assimilated to the variety just mentioned. In some of these "seton wounds" the whole track was laid open by sloughing; in others, suppuration was so abundant that the appertures of entrance and exit afforded insufficient space for the elimination of eschars and pus, and it was necessary to make one or more incisions along the track of the sinus. When wounds of the scalp became inflamed, cataplasms of flaxseed meal were commonly applied, or sometimes bread and water poultices, or compresses saturated with warm water. These emollient applications were occasionally medicated by solutions of chlorinated soda, permanganate of potassa, spirits of camphor, and infusions of belladonna. Ointments of the iodide of lead, sulphate of zinc, and nitrate of mercury are among the other local applications reported. In a number of cases where cerebral symptoms impended, besides resorting to general treatment, ice bladders were applied to the head This method was adopted with advantage in numerous cases at the Stanton Hospital, at Washington, under the direction of Surgeon John A. Lidell, U. S. V. From the Confederate Hospital No. 12, at Richmond, Virginia, a number of cases of inflamed scalp wounds, successfully treated by continuous irrigation, were reported by Surgeon W. A. Thom, C. S. A.

Gunshot Contusions of the Cranial Bones.—Among cases returned as gunshot wounds of the scalp were many in which exfoliations from the outer table of the skull, persistent pain at the point struck, secondary disorders of the brain, pyæmia, and other grave results indicated that there had been contusion of the skull without fracture.

The following forty-seven cases of gunshot contusion of the bones of the skull recovered without serious disability, and the men were returned to duty after intervals varying from thirty-five days to forty-three weeks:

Bean, J. W., Lieutenant, Co I, 5th New Hampshire Volunteers. Gunshot contusion of the temporal bone. Fredericksburg, Virginia, December 13th, 1862. Returned to duty January 9th, 1863.

Bowe, John, Corporal, Co. K, 1st Maryland Volunteers. Denudation of frontal bone by a conoidal musket ball. Petersburg, Virginia, August 20th, 1864. Returned to duty December 1st, 1864.

Cheesboro, Herman, Private, Co. G, 46th Pennsylvania Volunteers, aged 23 years. Gunshot contusion of the right parietal bone. Marietta, Georgia, June 15th, 1864. Returned to duty October 2d, 1864.

Clark, John, Private, Co. B, 116th Pennsylvania Volunteers. Gunshot contusion of the frontal bone. Fredericksburg, Virginia, December 13th, 1862. Returned to duty June 18th, 1863.

Cochrane, John, Private, Co. H, 141st New York Volunteers, aged 19 years. Gunshot contusion of the bones of the cranium. Resaca, Georgia, May 15th, 1864. Returned to duty August 19th, 1864.

Collins, T. J., Sergeant, Co. A, 22d Kentucky Volunteers. Gunshot contusion of right parietal bone. June 4th, 1863. Returned to duty July 22d, 1863.

Crouch, James N., Sergeant, 131st Pennsylvania Volunteers. Gunshot contusion of the left side of the occipital bone. Fredericksburg, Virginia, December 13th, 1862. Returned to duty May 12th, 1863.

Corman, Elisha, Private, Co. A, 5th United States Colored Troops, aged 34 years. Denudation and contusion of the cranial bones at the vertex by a fragment of shell. Deep Bottom, Virginia, September 29th, 1864. Returned to duty December 10th, 1864.

Crosby, J. W., Major, 61st Pennsylvania Volunteers. Contusion and denudation of the right parietal bone by a conoidal musket ball. Wilderness, May 5th, 1864. Returned to duty July 6th, 1864.

Dablaux, Charles, Private, Co. D, 42d Illinois Volunteers. Gunshot contusion of the temporal bone. Chickamauga, Georgia, September 19th, 1863. Returned to duty January 1st, 1864.

Diesze, August, Private Co. H, 47th Pennsylvania Volunteers, aged 25 years. Contusion and denudation of the cranial bones by a conoidal musket ball. Cedar Creek, Virginia, October 19th, 1864. Returned to duty January 19th, 1865.

Dollmeyer, Henry, Private, 3d Independent Ohio Cavalry, aged 23 years. Gunshot contusion of the cranium by a conoidal musket ball. Point Pleasant, Virginia, March 30th, 1863. Returned to duty July 5th, 1864. He recovered rapidly from the wound, but remained in hospital on account of distressing attacks of asthma.

Duke, Hiram, Private, Co. D, 14th Alabama Regiment. Gunshot contusion of the occipital region. Returned to duty September 3d, 1862.

Elwood, Solomon, Private, Co. A, 8th New York Cavalry, aged 25 years. Contusion and denudation of the frontal bone by a conoidal musket ball. Fisher's Hill, Virginia, October 7th, 1864. Returned to duty March 15th, 1865.

Foote, G. W., Corporal, Co. E, 51st Pennsylvania Volunteers. Gunshot contusion and denudation of the right parietal bone. Antietam, September 17th, 1862. Returned to duty June 17th, 1863.

Foster, S. M., Private, Co. E, 13th North Carolina Regiment. Gunshot contusion of the skull. Chancellorsville, Virginia, May 3d, 1863. Returned to duty.

Funk, John, Corporal, Co. I, 54th Pennsylvania Volunteers, aged 39 years. Contusion of the parietal bone by a musket ball. Newmarket, Virginia, May 15th, 1864. Returned to duty June 29th, 1864.

Gallutia, A. M., Private, Co. H., 53d Pennsylvania Volunteers, aged 23 years. Contusion of the left parietal region by a fragment of shell. Spottsylvania, May 11th, 1864. Returned to duty August 26th, 1864.

Gardner, William, Private, Co. B, 18th Indiana Volunteers. Gunshot contusion of the left parietal bone. Vicksburg, Mississippi, June 1st, 1863. Returned to duty August 17th, 1863.

Glynn, John, Private, Co. G, 57th New York Volunteers, aged 35 years. Gunshot contusion of the cranium. Petersburg, Virginia, June 16th, 1864. Returned to duty October 19th, 1864.

Hadfield, Michael E., Private, Co. F, 8th Ohio Cavalry, aged 23 years. Contusion of the left parietal bone by a conoidal musket ball. Bunker Hill, Virginia, September 5th, 1864. Returned to duty October 28th, 1864.

Hamilton, Wm. S., Private, Co. D, 14th New Hampshire Volunteers, aged 21 years. Contusion and denudation of the right parietal bone by a conoidal musket ball. Winchester, Virginia, September 19th, 1864. Returned to duty, November 28th, 1864.

Hyde, Thomas, Private, Co. F., 1st Vermont Cavalry, aged 18 years. Contusion of the bones of the cranium by a fragment of shell. Appomattox Court-house, Virginia, April 8th, 1865. Returned to duty June 29th, 1865.

Jones, Henry, Private, Co. E, 26th, United States Colored Troops. Contusion of the parietal bone by a conoidal musket ball. John's Island, South Carolina, July 7th, 1864. Returned to duty February 17th, 1865.

Kelley, C. T., Sergeant Major, 20th Kentucky Volunteers. Gunshot contusion of the bones of the cranium. Atlanta, Georgia, July 16th, 1864. Returned to duty September 21st, 1864.

Lakeman, William, employed on the Gunboat Carondelet. Contusion of the bones of the skull by a fragment of shell. Fort Henry, Tennessee, February 6th, 1862. Returned to duty May 6th, 1862.

Lennon, John A., Private, Co. A, 32d Massachusetts Volunteers, aged 23 years. Gunshot contusion of the bones of the cranium by a conoidal musket ball. Deep Bottom, Virginia. August 14th, 1864. Returned to duty September 22d, 1864.

Madore, Edward, Private, Co. M, 11th Vermont Volunteers, aged 17 years. Gunshot contusion of the right parietal bone by a conoidal musket ball. Cold Harbor, Virginia, June 4th, 1864. Returned to duty August 31st, 1864.

Martin, Jacob W., Corporal, Co. K, 101st Ohio Volunteers, aged 30 years. Contusion of the right parietal bone by a conoidal musket ball. Franklin, Tennessee, November 30th, 1864. Returned to duty February 1st, 1865.

Monroe, D. S., Corporal, Co. H, 20th Michigan Volunteers, aged 24 years. Gunshot contusion of the occipital bone by a musket ball. Petersburg, Virginia, October 28th, 1864. Returned to duty December 20th, 1864.

Osgood, Charles E., Co. A, 40th Massachusetts Volunteers, aged 32 years. Gunshot contusion of the left parietal bone. Cold Harbor, Virginia, June 3d, 1864. Returned to duty March 11th, 1865.

Ran, C. C., Private, Co. B, 114th Pennsylvania Volunteers, aged 27 years. Gunshot contusion of the left temporal bone, with lodgement of the ball, which was extracted soon after the reception of the injury. Gettysburg, July 3d, 1863. Returned to duty May 6th, 1864.

Robinson, William, Private, Co. E, 6th United States Infantry. Gunshot contusion of the left temporal bone by a pistol ball. Gettysburg, July 3d, 1863. Returned to duty September 4th, 1863.

Roth, Peter, Private, Co. E, 4th United States Artillery, aged 35 years. Gunshot contusion of left frontal. Petersburg, Virginia, March 31st, 1865. Returned to duty July 26th, 1865.

Ruggles, S. N., Private, Co. B, 157th New York Volunteers, aged 23 years. Gunshot contusion of the left parietal. Chancellorsville, May 3d, 1863. Returned to duty January 21st, 1864.

Russell, George G., Private, Co. E, 15th Maine Volunteers, aged 18 years. Contusion and denudation of the left temporal by a conoidal musket ball. Mine Run, Virginia, November 30th, 1863. Returned to duty April 19th, 1864.

Russell, Joseph, Private, Co. G, 27th Michigan Volunteers, aged 21 years. Gunshot contusion of the parietal by a conoidal musket ball. Petersburg, Virginia, July 23d, 1864. Returned to duty January 11th, 1865.

Sally, Charles H., Private, 4th Maine Battery. Contusion of the frontal bone by a fragment of shell. Cedar Mountain, Virginia, August 9th, 1862. Returned to duty, April 3d, 1863.

Satterly, William, Corporal, Co. G, 137th New York Volunteers, aged 43 years. Contusion of the right parietal by a conoidal musket ball. Resaca, Georgia, May 15th, 1864. Returned to duty, June 27th, 1864.

Selby, Harlow E., Sergeant, Co. G, 78th Illinois Volunteers. Gunshot contusion of the cranium. Chickamauga, Georgia, September 19th, 1863. Returned to duty, December 1st, 1863.

Shattuck, C. H., Private, Co. H, 142d New York Volunteers, aged 44 years. Contusion of the bones of the skull by a conoidal musket ball. Petersburg, Virginia, June 30th, 1864. Returned to duty, September 22d, 1864.

Shaw, William, Private, Co. G, 100th Illinois Volunteers, aged 21 years. Gunshot contusion of the skull by a fragment of shell. Kenesaw Mountain, Georgia, June 17th, 1864. Returned to duty, December 6th, 1864.

Shuey, Daniel, Private, Co. C, 148th Pennsylvania Volunteers, aged 26 years. Gunshot contusion and denudation of the mastoid process of the temporal bone. Gettysburg, July 2d, 1863. Returned to duty, September 11th, 1863.

Stalmaker, M. W., Sergeant, Co. E, 10th West Virginia Volunteers, aged 33 years. Gunshot contusion of the frontal by a musket ball. Cedar Creek, Virginia, October 13th, 1864. Returned to duty, November 7th, 1864.

Stephens, J. N., Private, Co. K, 30th Georgia Regiment. Gunshot contusion of left temporal. Gettysburg, Pennsylvania, July 3d, 1863. Returned to duty, August 24th, 1864.

Sumner, Jacob, Private, Co. D, 67th New York Volunteers, aged 31 years. Gunshot contusion of right parietal by a conoidal musket ball. Cold Harbor, June 1st, 1864. Returned to duty, August 9th, 1864.

Titus, George S., Sergeant, Co. F, 9th New Jersey Volunteers, aged 24 years. Gunshot contusion of the skull by a fragment of shell. Cold Harbor, June 3d, 1864. Returned to duty, December 13th, 1864.

Twenty-two cases are reported of gunshot contusion of the cranial bones, in which the patients were discharged or mustered out at the expiration of their terms of service without any serious physical disability. Brief notes of the particulars of these cases are appended :

Beveridge, J. G., Captain, Co. F, 2d Rhode Island Volunteers. Gunshot contusion of frontal bone over the right eye. Wilderness, May 7th, 1864. Mustered out of service, June 17th, 1864.

Brown, Charles, Sergeant, Co. G, 58th New York Volunteers. Gunshot contusion of the skull. Cross Keyes, Virginia, June 8th, 1862. Discharged from service, July 13th, 1862.

Brown, Patrick, Private, Co. H, 6th Pennsylvania Volunteers. Gunshot contusion of the cranial bones. Second Bull Run, August 29th, 1862. Discharged from service, December 20th, 1862.

Creasey, John F., Private, Co. I, 124th Illinois Volunteers. Gunshot contusion of left parietal by a fragment of shell. Vicksburg, June 26th, 1863. Treated at Memphis, by Surgeon J. D. Brumley, U. S. V. Returned to duty, and subsequently mustered out of service. Became a pensioner, June 29th, 1865, on account of chronic diarrhœa. He died about the 20th of August, 1865, having had, according to the report to the Pension Office of his attending physician, W. D. Yargan, M. D., no head symptoms.

Doolittle, Henry, Private, Co. H, 2d Michigan Volunteers. Gunshot contusion of cranium, with denudation of bone. Near Knoxville, Tennessee, November 16th, 1863. Mustered out of service, July 20th, 1864.

Gay, William, Private, Co. A, 2d Ohio Cavalry, aged 20 years. Contusion of the frontal bone by a conoidal musket ball. Petersburg, July 30th, 1864. Treated at Mount Pleasant and Mower Hospitals. Discharged, June 13th, 1865. *General Order, A. G. O., No.* 77, 1865.

Head, Albert, Captain, Co. F, 10th Iowa Volunteers, aged 24 years. Gunshot contusion of right parietal by round musket ball. Champion Hill, May 16th, 1863. Treated at Officers' Hospital, Memphis, Tennessee. Mustered out on expiration of term of service, December 17th, 1864.

Hensler, Charles, Sergeant, Co. F, 6th Wisconsin Volunteers, aged 23 years. Denudation of right parietal by conoidal musket ball. Southside Railroad, Virginia, March 31st, 1865. Treated at Lincoln and Harvey Hospitals. Mustered out of service, July 10th, 1865.

Houtz, James, Private, Co. K, 111th New York Volunteers, aged 19 years. Contusion of the frontal bone by a conoidal musket ball. Petersburg, Virginia, April 2d, 1865. Discharged from service, June 8th, 1865.

Knox, E. B., Major, 44th New York Volunteers. Denudation and contusion of occipital bone by shell. Spottsylvania, May 8th, 1864. Treated at Fifth Corps Hospital, and at Washington, by Surgeon T. Antisell, U. S. V. Leave of absence granted, May 17th, 1864, and mustered out with his regiment, October 11th, 1864.

Lloyd, William, Private, Co. G, 122d Ohio Volunteers, aged 28 years. Contusion of os frontis by conoidal ball denuding the bone. Accidental, April 15th, 1865. Entirely recovered when discharged June 9th, 1865.

McConnell, James, Private, Co. A, 9th New York Volunteers, aged 25 years. Gunshot contusion of skull by a buckshot. Antietam, Maryland, September 17th, 1862. Discharged, at expiration of term of service, April 24th, 1863.

Morihan, James, Private, Co. C, 110th Pennsylvania Volunteers, aged 20 years. Denudation and contusion of frontal bone by fragment of shell. Petersburg, June 16th, 1864. Treated at Harewood. Mustered out of service, June 21st, 1864.

Morton, D. J., Lieutenant, Co. G, 143d Pennsylvania Volunteers. Gunshot contusion of the bones of the skull. Wilderness, May 6th, 1864. Treated at the Fifth Corps Hospital and at Washington. Mustered out with his regiment, June 12th, 1865.

Murphy, Daniel, Private, Co. A, 29th Massachusetts Volunteers, aged 54 years. Contusion of the temporal by a fragment of shell. Fort Steadman, Virginia, March 25th, 1865. Treated at DeCamp and Dale Hospitals. Mustered out of service, September 11th, 1865. Surgeon C. N. Chamberlain, U. S. V., records the case.

Plymesser, Samuel J., Sergeant, Co. G, 6th Iowa Volunteers. Gunshot contusion of the skull. Kenesaw Mountain, Georgia, June 27th, 1864. Recovered, and was promoted to a lieutenantcy, and, finally, mustered out with his regiment, July 21st, 1865.

Sands, R. M., Private, Co. I, 1st Maryland Cavalry, aged 34 years. Contusion of cranial bones by a conoidal musket ball. Treated at City Point and Beverly Hospitals. Discharged on expiration of term of service, September 28th, 1864.

Sprague, Thomas C., Sergeant, Co. C, 155th Pennsylvania Volunteers, aged 45 years. Contusion of frontal bone by a conoidal musket ball, the bone being slightly denuded of periosteum. Hatcher's Run, Virginia, March 25th, 1865. Treated at Lincoln, Satterlee, and McClellan Hospitals. Discharged from service, August 14th, 1865.

Van Valkenberg, E. P., Co. C., 39th Illinois Volunteers, aged 26 years. Gunshot contusion of left parietal. Petersburg, April 1st, 1865. Treated at Harewood and Harvey Hospitals. Discharged July 18th, 1865.

Waite, Benjamin, Sergeant, Co. B, 198th Pennsylvania Volunteers, aged 25 years. Contusion of frontal by a conoidal musket ball. Southside Railroad, Virginia, March 31st, 1865. Mustered out of service, May 27th, 1865.

Walker, Hugh, Private, Co. L, 5th Iowa Cavalry, aged 19 years. Gunshot contusion of the skull. Fort Donelson, Tennessee, February 15th, 1862. Discharged from service, April 1st, 1863.

Way, A. M., Major, 1st New Jersey Volunteers. Denudation of right temporal by a musket ball. Wilderness, May 6th, 1864. Treated by Surgeon Antisell, U. S. V. Mustered out with regiment June 23d, 1864, and pensioned from that date. Pension Examiner A. D. Newell states, September 1st, 1864, that "The blow was so shocking that he cannot stand excitement or go out in the sun. He is not able to do any work, but will soon improve. His disability is total, and likely to continue about six months." Examining Surgeon J. G. Stearns reports to the Pension Bureau, December 12th, 1864, that "The patient is one-fourth incapacitated, though less every month."

In twenty-eight cases of gunshot contusion of the cranium, the patients were furloughed when convalescent, and no further accounts of them appear:

Allen, C. A., Private, Co. E, 18th North Carolina Regiment. Gunshot contusion of the cranium. Chancellorsville, May 3d, 1863. Treated in Hospital No. 23, Richmond, Virginia. Furloughed June 2d, 1863.

Aikens, L., Lieutenant, Co. I, 9th Georgia Infantry. Gunshot contusion of the right temporal region. July 4th, 1864 Furloughed July 14th, 1864. Surgeon J. B. Read, C. S. A., reports the case.

Bryan, J. L, Sergeant, Co. E, 11th Florida Regiment. Gunshot contusion of the frontal bone. Treated at Howard Grove Hospital, Richmond. Furloughed August 9th, 1864.

Collins, J., Private Co. A, 1st Minnesota Battery, aged 27 years. Gunshot contusion of the frontal bone. October 10th, 1864. Furloughed November 1st, 1864.

Cooper, M. A., Private, Co. E, 4th Alabama Infantry. Gunshot contusion of the temporal bone. Wilderness, May 5th, 1864. Treated at Howard Grove Hospital, Richmond. Furloughed June 3d, 1864.

Corsey, William, Private, Co. I, 47th Alabama Regiment. Gunshot contusion of the skull. Treated at Howard Grove Hospital, Richmond. Furloughed June 6th, 1864.

Cowart, J. L., Corporal, Co. E, 10th Georgia Battalion. Gunshot contusion of the frontal bone. Farmville, Virginia, May 27th, 1864. Furloughed June 14th, 1864.

De Gray, James, Lieutenant Co. G, 1st Minnesota Volunteers. Gunshot contusion of the cranial bones. Gettysburg, July 3d, 1863. Leave of absence granted him on August 15th, 1863.

Edwards, D. H., Private, Co. A, 12th Georgia Regiment. Gunshot contusion of the skull. Chancellorsville, May 3d, 1863. Furloughed June 6th, 1863.

Fannin, A. B., Lieutenant, Co. F, 61st Alabama Infantry. Gunshot contusion of the cranium. Winchester, Virginia, September 19th, 1864. Treated at Hospital No. 4, Richmond, Virginia. Furloughed September 29th, 1864.

Foley, John W., Sergeant, Co. C, 124th New York Volunteers. Gunshot contusion of the cranium. Chancellorsville, May 3d, 1863. Furloughed July 10th, 1863.

Forbes, S. F., Private, Co. K, 7th Tennessee Regiment, aged 21 years. Gunshot contusion of the frontal bone. Wilderness, May 6th, 1864. Furloughed May 8th, 1864.

Gilbuck, J. M., Private, Co. K, 43d Alabama Regiment. Gunshot contusion of the skull. Wilderness, May 7th, 1864. Furloughed May 26th, 1864.

Harper, E. F., Private, Co. F, 16th Georgia Regiment. Gunshot contusion of the skull. Chancellorsville, May 3d, 1863. Furlonghed July 1st, 1863.

Hensley, John C., Captain, Co. G, 59th Alabama Infantry. Gunshot contusion of temporal bone. Wilderness, May 6th, 1864. Furloughed from Howard Grove Hospital, Richmond, Virginia, May 25th, 1864.

Hutchinson, R. M., Private, Co. F, 24th Virginia Cavalry, aged 30 years. Contusion of the right parietal by a conoidal musket ball, October 7th, 1864. Treated at Chimborazo Hospital, Richmond. Furloughed October 20th, 1864.

Jones, J. J., Lieutenant, Co. B, 13th Virginia Regiment. Gunshot contusion of the cranium. Treated at Jackson and Howard Grove Hospitals, Richmond. Furlonghed June 2d, 1864.

Knight, Jeff., Private, Co. D, 8th South Carolina Infantry. Gunshot contusion of the frontal bone. Treated at Howard Grove Hospital, Richmond. Furloughed August 7th, 1863.

Lucas, B., Private, Co. H, 17th North Carolina Regiment. Gunshot contusion of the frontal. Petersburg, Virginia, June 18th, 1864. Treated in hospital at Farmville. Furloughed July 1st, 1864.

McLear, D. B., Lieutenant, Co. I, 24th North Carolina Regiment. Gunshot contusion of the bones of the skull. Treated at Howard Grove Hospital, Richmond. Furloughed May 25th, 1864.

Mansell, S. V., Private, Co. E, 6th Florida Regiment. Gunshot contusion of the skull. Treated at Howard Grove Hospital, Richmond. Furloughed June 10th, 1864.

Saunders, E. P., Private, Co. D, 12th Mississippi Regiment. Gunshot contusion of the parietal. Furloughed June 20th, 1864. Surgeon F. M. Palmer, P. A. C. S., recorded the case.

Shealey, J. M., Private, Co. K, 1st South Carolina Regiment. Gunshot contusion of frontal bone. Furloughed from Jackson Hospital, Richmond, Virginia, October 29th, 1864, for sixty days.

Sherwood, J. J., Private, Co. E, 3d Alabama Regiment. Gunshot contusion of skull. Wilderness, May 5th, 1864. Furloughed May 25th, 1864, from Howard Grove Hospital, Richmond.

Sydnor, T. W., Lieutenant, Co. G, 4th Virginia Cavalry. Gunshot contusion of right temporal bone, August 13th, 1864. Furloughed from No. 4 Hospital, Richmond, August 25th, 1864. Surgeon J. B. Read, C. S. A., recorded the case.

Walker, A., Private, Co. A, 43d Alabama Regiment. Gunshot contusion of the frontal. Treated at Howard Grove Hospital, Richmond. Furloughed August 11th, 1864.

Whitley, J. J., Private, Co. C, 8th Alabama Regiment. Gunshot contusion of the parietal. Wilderness, Virginia, May 5th, 1864. Furloughed May 30th, 1864, for sixty days.

Wiley, Jacob S., Corporal, Co. K, 18th South Carolina Infantry. Gunshot contusion of right parietal. Petersburg, May 20th, 1864. Furloughed June 13th, 1864.

Six patients recovered without serious disability, and were transferred to the Provost Marshal, or exchanged, or were paroled or released.

Bodman, Hardy, Private, Co. K, 2d North Carolina Regiment, aged 21 years. Contusion of the occipital by a conoidal ball, which entered near the upper portion of the left ear, and ploughed under the scalp for three inches. Kelly's Ford, November 7th, 1863. Treated at Lincoln Hospital, Washington, till December 7th, thence transferred to Old Capital Prison for exchange.

Bullock, N. B., Private, Co. G, 5th Alabama Regiment. Contusion of right parietal bone by a conoidal musket ball. Winchester, Virginia, September 19th, 1864. Transferred for exchange, October 25, 1864.

Galloway, J. T., Private, Co. E, 25th North Carolina Regiment, aged 34 years. Contusion of frontal bone by a conoidal musket ball. Hatcher's Run, Virginia, April 1st, 1865. Released June 14th, 1865.

Glenn, Wade M., Private, Co. A, 14th Tennessee Infantry, aged 25 years. Gunshot contusion of occipital bone. Petersburg, Virginia, April 2d, 1865. Transferred to Old Capitol Prison for exchange, April 17th, 1865.

Fisher, John H., Private, Co. E, 36th North Carolina Regiment. Contusion of the frontal bone by a fragment of shell. Fort Fisher, North Carolina, January 15, 1865. Transferred to Provost Marshal, April 8th, 1865.

Woodburn, W., Private, Co. K, 43d North Carolina Regiment. Gunshot contusion of the skull. Gettysburg, July 3d, 1863. Treated at DeCamp Hospital, New York Harbor. Paroled September 5th, 1863.

Nine patients, with gunshot contusions of the cranium, deserted from hospital, and it may be inferred that their disabilities were not of a serious nature.

Diffenbach, P., Private, Co. A, 7th New York Volunteers, aged 33 years. Contusion of the occipital by a six-pound iron ball. Antietam, September 17th, 1862. Treated at Camden Street, Baltimore. Deserted December 4th, 1862.

Eddy, Alonzo F., Private, Co. I, 18th Massachusetts Volunteers, aged 25 years. Gunshot contusion of the skull. Wilderness, May 5th, 1864. Treated at Corps, Campbell, and Beverley Hospitals. Deserted October 15th, 1864.

Glenn, Jacob, Private, Co. K, 1st Pennsylvania Rifles, aged 35 years. Contusion of the occipital bone by a fragment of shell. Petersburg, Virginia, June 17th, 1864. Treated at Division, Mount Pleasant, and York Hospitals. Deserted October 20th, 1864.

Hasselriss, William, Private, Co. C, 98th Pennsylvania Volunteers, aged 30 years. Contusion of the frontal bone by a fragment of shell. Cedar Creek, Virginia, October 19th, 1864. Treated at Division and Cuyler Hospitals. Deserted January 8th, 1865.

Hoffman, Henry, Private, Co. K, 7th Ohio Volunteers, aged 23 years. Contusion of right temporal by a conoidal musket ball. Chancellorsville, May 3d, 1863. Treated at Douglas and Cincinnati Hospitals. Deserted November 16th, 1863.

McCall, James, Private, Co. A, 147th Pennsylvania Volunteers. Contusion of the temporal by a fragment of shell. Gettysburg, July 3d, 1863. Treated at Seminary and Satterlee Hospitals. Deserted September 15th, 1863.

McElroy, James, Private, Co. F, 36th Wisconsin Volunteers, aged 40 years. Contusion of the frontal bone by a conoidal musket ball. Petersburg, Virginia, June 24th, 1864. Treated at Division, Lincoln, and York Hospitals. Deserted September 20th, 1864.

Ryan, Thomas, Private, Co. H, 58th Massachusetts Volunteers, aged 35 years. Contusion of left temporal by a conoidal musket ball. Cold Harbor, June 3d, 1864. Treated at Ninth Corps field, Harewood, and Mower Hospitals. Suffered on exposure to the sun. Deserted December 2d, 1864.

Wispert, Adam, Private, Co. H, 91st Pennsylvania Volunteers, aged 23 years. Gunshot contusion of the occipital. Petersburg, Virginia, June 18th, 1864. Treated at Division, Lincoln, and Satterlee Hospitals. Deserted August 9th, 1864.

In ten instances, men in whom this form of injury had been diagnosticated, recovered and were returned to modified duty in the Veteran Reserve Corps, in accordance with a General Order from the Adjutant General's Office. On their discharge, at the close of the war, four of them were pensioned, and six had no disabilities. The disabilities of the four pensioners appeared to have been of a slight nature, limited to pain and headache on exposure.

Barnes, John K., Private, Co. C, 23d Illinois Volunteers, aged 27 years. Contusion of the skull by a conoidal musket ball. Winchester, Virginia, July 24th, 1864. Treated at Jarvis and Mower Hospitals. Transferred to Co. 118, 2d Battalion of the Veteran Reserve Corps, January 19th, 1865. Not on Pension Roll.

Hastings, T. J., Private, Co. E, 3d Vermont Volunteers, aged 18 years. Contusion of the frontal bone by a fragment of shell. Cold Harbor, Virginia, June 3d, 1864. Treated at Lincoln, McKim's, and Brattleboro' Hospitals. Transferred to Co. G, 2d Veteran Reserve Corps, November 26th, 1864. Discharged July 18th, 1865. Pension Examiner C. S. Cahoon, of Lynden, Vermont, reported, on February 17th, 1867, that this man then complained of giddiness and pain in the head.

Hefler, William C., Corporal, Co. E, 2d Pennsylvania Heavy Artillery, aged 20 years. Contusion of the frontal by a fragment of shell. Petersburg, Virginia, August 2d, 1864. Treated at Field and Satterlee Hospitals. Transferred to the Veteran Reserve Corps, 2d Battalion, January 16th, 1865. Mustered out November 21st, 1865, and pensioned in April, 1867. Pension Examining Surgeon R. Simington reported that this pensioner suffered from congestion of the brain on slight exposure to the sun or fire heat, and rated his disability at one-half, and probably not permanent.

McCarthy, J., Private, Co. A, 42d New York Volunteers, aged 20 years. Contusion of the frontal by a fragment of shell. Gettysburg, July 2d, 1863. Treated at Field and Satterlee Hospitals. Transferred to Veteran Reserve Corps, December 13th, 1863. Mustered out, on expiration of term, June 27th, 1864. Pension Examining Surgeon E. A. Smith reported, December 6th, 1865, that this man was a pensioner and suffered from headache.

McLarney, P., Private, Co. G, 69th New York Volunteers, aged 40 years. Contusion of the right temporal by a conoidal musket ball, destroying the sight of the right eye. Cold Harbor, Virginia, June 3d, 1864. Treated at Fairfax Seminary and Mower Hospitals. Transferred to the Veteran Reserve Corps, January 28th, 1865. Discharged July 8th, 1865 and pensioned. Died in 1868.

Oberholtzer, S. W., Private, Co. G, 55th Ohio Volunteers, aged 33 years. Contusion of the parietal by a conoidal musket ball. Chancellorsville, Virginia, May 3d, 1863. Treated at Field, Alexandria, Satterlee, Patterson Park, and Camp Dennison Hospitals. Transferred to the Veteran Reserve Corps, November 17th, 1863. Discharged for disability, October 27th, 1864, and pensioned from that date.

Ringwald, W. A., Private, Co. E, 24th Michigan Volunteers, aged 19 years. Gunshot contusion of the occipital. North Anna, Virginia, May 23d, 1864. Treated at Field, Fairfax Seminary, Haddington, and St. Mary's Hospitals. Transferred to the 2d regiment Veteran Reserve Corps, August 31st, 1864. Discharged July 17th, 1865, and name not found on Pension Roll.

Roberts, E. A., Private, Co. E, 20th Indiana Volunteers, aged 15 years. Contusion of the left parietal by a fragment of shell. Petersburg, Virginia, June 16th, 1864. Treated at Division and Lincoln Hospitals. Transferred to the 9th regiment Veteran Reserve Corps, December 8th, 1864. Not on Pension Roll.

Shappie, Francis, Private, Co. B, 60th New York Volunteers, aged 19 years. Contusion of the occipital by a conoidal musket ball, which lodged in the back of the neck. Gettysburg, July 2d, 1863. Treated at Satterlee Hospital, where the missile was extracted on September 18th. Transferred to the 9th regiment Veteran Reserve Corps, December 31st, 1863. Not pensioned.

Walsh, Michael, Private, Co. K, 5th Connecticut Volunteers, aged 21 years. Contusion of the right parietal bone by a conoidal musket ball. Cedar Mountain, Virginia, August 9th, 1862. Transferred to Co. 21, 2d Battalion Veteran Reserve Corps, September 1st, 1863. Mustered out, on expiration of term of service, July 22d, 1864.

The patients named in the following list were discharged from service on account of serious disabilities, the nature of which was not specified:

HEMPTON, E. M., Co. B, 3d New Hampshire Volunteers. Gunshot contusion of the parietal region. Morris Island, South Carolina. Discharged from service November 11th, 1863. Surgeon A. J. H. Buzzell, 3d New Hampshire Volunteers, regarded the disability as total.

NOYES, SAMUEL G., Sergeant, Co. A, 40th Massachusetts Volunteers, aged 22 years. Gunshot contusion of left temporal bone, by a conoidal musket ball. Cold Harbor, Virginia, June 3d, 1864. Treated at Field, Slough, York, Mason, Boston, and Readville hospitals. Discharged from the latter, November 17th, 1864, for disability resulting from injury to skull.

O'BRIEN, J., Private, Co. C, 28th Massachusetts Volunteers. Gunshot contusion of the skull. Treated at Carver Hospital. Discharged from service March 14th, 1863. Disability considered as total.

Many of the cases of gunshot contusion of the cranial bones were followed by very grave symptoms. Hæmorrhage, erysipelas, and gangrene were the early complications of the superficial portions of the wounds; periostitis, caries, and exfoliation often resulted from the injury to the bone; and, in some instances, the mischief extended to the membranes or to the brain itself. The remote effects included persistent pain in the point struck, vertigo, chronic irritation of the brain, mental imbecility, epilepsy, and impairment of the special senses, especially by amaurosis and deafness.

Hæmorrhage.—Of the cases belonging to this category, one was complicated by primary, one by secondary hæmorrhage, and a third, by hæmorrhage in connection with extensive sloughing. The brief notes of these cases are as follows:

NEWCOMBE, JOHN S., Private, Co. E, 50th New York Volunteers. Contusion of the left temporal by a ball accidentally discharged from his own musket on the Battery, at New York City, September, 18th, 1861. The temporal artery was partly divided and there was profuse hæmorrhage. When taken to hospital he was insensible. The artery was still bleeding. It was ligated near the zygoma. He died September 21st, 1861, from inflammation of the brain.

WHITE, JOHN F., Lieutenant, Co. C, 134th Pennsylvania Volunteers. Contusion, by a shell fragment, of the right parietal bone, near the sagittal suture. Fredericksburg, December 13th, 1862. Treated at Field, Point Lookout, and Philadelphia Officers' hospitals. Free hæmorrhage, on two occasions, from branches of the temporal. The bleeding was arrested by compression. There was burrowing of pus and an abscess formed near the ear. The wound healed by the end of January, and the patient returned to duty on February 17th, 1863.

Brooks, John, Private, ——— Artillery, aged 37 years. Gunshot contusion of the temporal. Admitted, August 11th, 1863, to the Louisiana Hospital at Richmond, under the care of Assistant Surgeon H. N. Young, C. S. A. The scalp wound was in a gangrenous condition, and soon after a profuse hæmorrhage took place from the posterior auricular artery. This recurred repeatedly, though temporarily controlled by pressure, and death took place on August 12th, 1863, the following day.

Erysipelas.—Six of the cases of gunshot contusion of the skull are reported to have been complicated by erysipelas. Two of these cases were fatal:

BAKER, JOHN C., Private. 104th Ohio Volunteers, aged 22 years, was wounded, at the battle of Franklin, Tennessee, November 30th, 1864, by a conoidal ball, which caused a flesh wound of the left side of the head. He was conveyed to Nashville, and thence sent to Jeffersonville, Indiana, on January 11th, 1865, suffering from erysipelas. On February 23d, he was transferred to Lincoln Hospital, Washington, D. C., and, on June 17th, 1865, was mustered out of service.

GILDERSLEEVE, WM., Corporal, Co. D, 40th New York Volunteers, aged 23 years, was wounded, in the engagement near Petersburg, Virginia, March 25th, 1865, by a conoidal musket ball, which entered the scalp over the lamboidal suture and crossing the occipital bone obliquely, emerged three inches from the wound of entrance, grazing the bone in its passage. He received, at the same time, a wound of the little finger of the left hand. He was, on the following day, admitted to the hospital of the 2d division, Second Corps, and, on March 27th, was transferred to the Finley Hospital, Washington, D. C. On admission, the symptoms were favorable; but, on March 31st, coma, with stertorous breathing, supervened. Sinapisms were applied to nape of neck, wrists, and ankles, and, on the following day, consciousness returned, and the patient felt much improved. On April 4th, erysipelas of the scalp set in, and on April 18th, symptoms of pneumonia appeared; but from April 26th, he gradually recovered and was returned to duty on December 8th, 1865. He was pensioned for one year. Pension Examining Surgeon M. D. Benedict reported, August, 1865, that his disabilities would not be permanent.

KING, GEORGE D., Private Co. I, 21st Michigan Volunteers, was wounded, at the battle of Stone River, December 31st, 1862, by a musket ball, which struck behind the left ear and lodged under the scalp, lying against the bone. He was sent to Hospital No. 7, Louisville, Kentucky. On January 15th, 1863, erysipelas supervened. He gradually recovered, and on April 15th, he was transferred to Hospital No. 19. On the 27th, he was readmitted to Hospital No. 7. Four months after the reception of the injury the ball was extracted. The sense of hearing was entirely destroyed. He was discharged from service

for disability rated at one-half, on May 16th, 1863. Surgeon J. L. Teed, 38th Illinois Volunteers, and the Adjutant General of Michigan, and Acting Assistant Surgeon W. W. Goldsmith report the case. A year subsequently, Pension Examining Surgeon Geo. W. Mears, reports that the wound was still discharging slightly. There was, probably, a scale of the outer table detached.

THOMPSON, JACOB, Cook, 11th Illinois Cavalry, aged 26 years, was wounded at Fort Pillow, Tennessee, April 12th, 1864, by two musket balls, one of which crossing the vertex of the cranium, inflicted a scalp wound and contused the bone. He was conveyed to Mound City Hospital, Illinois, on April 16th. Erysipelas of the head supervened and an abscess formed under the integuments, which caused much pain and febrile reaction. The abscess having been opened, the patient steadily improved, and on May 20th, 1864, Surgeon Horace Wardner, U. S. V., reports that he was returned to duty entirely cured.

WHITLOCK, GEORGE H., Private, Co. G, 109th Illinois Volunteers, aged 37 years, was wounded before Petersburg, July 30th, 1864, by a musket ball, which tore up the scalp in the temporal region, and denuding the skull. First treated at the field hospital of 3d division of the Ninth Corps, he was transferred, on August 2d, to the Mount Pleasant Hospital at Washington. The register of this hospital states that the outer table was indented but not fractured. Erysipelas of the scalp set in, and the case terminated fatally on December 1st, 1864.

Wright, S. C., Private, Co. G, 8th Florida Regiment, was, on October 2d, 1863, admitted to Chimborazo Hospital at Richmond, Virginia, with a gunshot wound of the scalp with contusion of the skull. An attack of erysipelas supervened; but this was readily subdued. After this, the patient suffered from acute dysentery. He died from this complication on December 5th, 1863. Surgeon J. B. McCaw, P. A. C. S., reports the case.

Gangrene.—Two cases of gunshot contusion of the cranium were complicated by sloughing of the scalp; both ultimately recovered:

ALLEN, GEORGE H., Sergeant, Co. G, 146th New York Volunteers, aged 20 years, was wounded, at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a piece of shell, which tore the scalp over the right parietal, to the extent of two inches, denuding the bone of periosteum. He was admitted to the field hospital of the 2d division of the Fifth Corps, and, on the 10th, transferred to the Satterlee Hospital at Philadelphia, Pennsylvania. Phagedenic action in the wound was promptly arrested by a lotion of nitric acid. Some exfoliation of the bone occurred in the progress of the case. The patient recovered and was returned to duty on the 23d of September, 1863. His name does not appear on the Pension List. The case was reported by Acting Assistant Surgeon J. B. Trenor.

Smith, J. W., of Captain Randolph's Company of Louisiana Infantry, was wounded, at the battle of Chancellorsville, May 2d, 1863, by a gunshot projectile which lacerated the scalp and contused the skull. He was conveyed to Richmond and placed in the Louisiana Hospital. Erysipelas, followed by gangrene, supervened. Detergent lotions were applied, and after a while the wound presented a healthy granulating surface, and eventually cicatrized. The patient was furloughed on June 3d, 1863.

Periostitis.—In a few instances protracted inflammation of the contused pericranium was observed:

COFFEY, PATRICK, Private, Co. E, 37th New York Volunteers, received, at the battle of Williamsburg, Virginia, May 5th, 1862, a gunshot wound of the scalp with injury to the occipital bone. He was, on May 11th, admitted to the Mill Creek Hospital, and, on May 22d, was sent to the Ladies' Home Hospital, New York, whence he was returned to his regiment. He was, however, readmitted on June 12th, 1863, and was discharged from the service on June 23d, 1863. The injury to the bone was trivial probably. No application for pension appears on the rolls of the Interior Department.

HARRICK, CHARLES, Private, Co. D, 94th New York Volunteers, aged 25 years, received, at Gettysburg, July 3d, 1863, a contusion of the right parietal bone at the lower posterior angle, by a conoidal musket ball which lodged under the integuments. He was admitted to Satterlee Hospital, Philadelphia, on July 10th, and, on the following day, the position of the ball was detected by a probe and the missile was extracted. A slight scale of the outer table necrosed, and the pericranium was inflamed for a while; but the wound ultimately did well, and the soldier was returned to duty December 3d, 1863. His name is not found on the Pension List.

LUSK, SAMUEL R., Sergeant, Co. E, 137th New York Volunteers, aged 28 years, received, in the engagement on the Wauhatchie River, Tennessee, October 28th, 1863, a gunshot contusion of the right portion of the occipital bone. He was, on the following day, admitted to Hospital No. 3, Chattanooga. He probably, shortly afterwards, returned to duty, as in June, 1864, he was again admitted to the field hospital of the 2d division, Twentieth Corps, suffering from the old injury. He was, on June 18th, sent to Hospital No. 2, Chattanooga, Tennessee, on June 20th, to the Cumberland Hospital, Nashville, on June 27th, to the Brown Hospital, Louisville, Kentucky, and on July 1st, to Camp Dennison, Ohio, whence he was returned to duty on July 18th, 1864. He was discharged on June 28th, 1865. Examining Surgeon J. G. Orton reports, April 19th, 1869, that this pensioner was nervous, sleepless, depressed in spirits, and able to work but little.

PRATT, THOMAS D., Private, Co. D, 18th Massachusetts Volunteers, received, at the battle of Fredericksburg, Virginia, December 13th, 1862, a gunshot wound of the head. He was admitted to the hospital of the 3d division, Second Corps, and, on December 16th, was sent to the hospital at Point Lookout, Maryland. Here it was ascertained that the right temporal bone had become necrosed. On May 1st, 1863, the patient was sent to the West's Buildings Hospital, Baltimore, Maryland, and, on May 18th, to the Lovell Hospital, Portsmouth Grove, Rhode Island, where he was transferred to the Veteran Reserve Corps, on July 18th, 1863. His name is not on the Pension Rolls.

Exfoliation.—This was frequently observed in gunshot contusions of the skull. Many examples are noticed in the categories of other complications. The following twenty-five cases were also reported:

Brown, C., Private, Co. F, 11th South Carolina Battery, received, on July 30th, 1864, a gunshot wound of the scalp, with probable contusion of the bone. He was admitted into the Jackson Hospital at Richmond, Virginia, on September 16th. Exfoliation resulted, and, after the separation of a scale of bone, he recovered.

Crinyan, James, Private, Co. H, 14th Connecticut Volunteers, aged 48 years, received, at the battle of the Wilderness, May 5th, 1864, a contusion of the skull, by a conoidal musket ball. He had already been wounded at Chancellorsville, in the left hand, and at Gettysburg, over the left knee, and he was somewhat lame from the latter injury, while the former had caused luxation of the thumb. He was sent to Washington, on May 11th, having been treated meanwhile at the field hospital of the 2d division of the Second Corps. He was removed, on June 28th, to Summit House Hospital, Philadelphia, on July 17th, to Knight Hospital, New Haven, and, on October 17th, to the hospital at Readville, Massachusetts, whence he was discharged on March 10th, 1865. During his sojourn at Readville, an exfoliation of the outer table of the skull took place. He was pensioned, and in June, 1865, Pension Examining Surgeon J. Cumminskey reported that he suffered from headache and dizziness, and was unfit for the Veteran Reserve Corps.

Diehl, George, Private, Co. E, 100th New York Volunteers, aged 27 years, received, in the engagement at Chester Station, Virginia, May 12th, 1864, a gunshot contusion of the left parietal near the temporal suture. On May 15th, he was admitted to Hampton Hospital, and, on May 18th, he was sent to the hospital at Point Lookout, thence, on July 12th, to Judiciary Square Hospital at Washington, and, on July 18th, to the Sisters of Charity Hospital, Buffalo. The outer table of the bone had exfoliated, and the wound was granulating and looking well, when, on August 16th, typhoid fever set in, and the case terminated fatally on August 23d, 1864.

Duggins, R., Private, Co. C, 11th South Carolina Regiment, received, on June 18th, 1864, a gunshot contusion of the left parietal bone. He was admitted to the Confederate hospital at Farmville, Virginia, on June 21st. The external table of the parietal bone exfoliated; otherwise the case did well, and the patient was furloughed on July 8th, 1864, for sixty days.

Fauck, Albert, Private, Co. K, 94th Pennsylvania Volunteers, aged 20 years, was wounded, in a skirmish near the Rappahannock, by a buckshot, which entered the scalp over the vertex of the cranium and lodged near the skull. The missile was extracted on the same day. On September 1st, he was admitted to the Camden Street Hospital, Baltimore. Some slight exfoliation, not involving the entire thickness of the outer table, took place; and then the wound healed kindly, and, on October 11th, 1862, the patient was sent to the Convalescent Camp at Fort McHenry, Baltimore, for duty. The case is reported by Acting Assistant Surgeon Edmund G. Waters. His name does not appear on the Pension Rolls.

George, J. R., Private, Co. B, 9th Louisiana Regiment, received, on April 30th, 1863, a gunshot wound of the head. He was admitted to the Louisiana Hospital, Richmond. The external table of the bone was contused and exfoliated, yet the case progressed favorably, and, on June 10th, 1863, the patient was furloughed.

Goldey, James H., Private, Co. A, 90th Pennsylvania Volunteers. Supposed gunshot scalp wound over occipital. Antietam, September 17th, 1862. Entered hospital at Washington, September 23d. Transferred to Fort Schuyler Hospital, New York, October 7th. Transferred to Fort Hamilton, December 1st. On December 13th, he entered the Satterlee Hospital, Philadelphia, complaining of pain in the occipital region. The wound was closed, but it reopened on December 18th. On January 18th, 1863, a circular portion of dead bone, an inch in diameter, was detected by a probe. The patient had no pain or derangement of the mental faculties, and walked actively about the ward. About February 2d, the discharge from the wound was profuse, and the necrosed bone had not separated. There was no change in his condition until February 25th, when the exfoliation was observed to be loose, and it was removed by Acting Assistant Surgeon J. N. Moore through a crucial incision. The exfoliation consisted of a portion of the external table, an inch in diameter, and several smaller pieces. On March 3d, yet another piece of the external table was removed. On March 17th, the wound was nearly healed. The patient felt entirely well; and on May 22d, 1862, he was discharged from service. He appears to have had no subsequent trouble, since his name does not appear on the list of applicants for pension.

Handleton, George W., Private, Co. D, 95th Pennsylvania Volunteers, aged 30 years, was wounded at the battle of Cold Harbor, Virginia, June 2d, 1864, by a conoidal musket ball, which contused the frontal bone. He was conveyed to Alexandria, and admitted into the 3d Division Hospital on June 6th, and from there sent to the York Hospital, Pennsylvania, on June 14th, 1864. He recovered, and was discharged from service on January 12th, 1865. In a communication dated January, 1868, the Commissioner of Pensions states that Handleton receives a pension of four dollars per month, his disability being rated one-half and temporary. On December 20th, 1865, Examining Surgeon Z. Reed reported that portions of the outer table of the frontal bone had exfoliated, and that a profuse ill-conditioned pus continued to be discharged from the wound. The patient's general health was much impaired, and about one-half the time he was incapacitated from obtaining his subsistence by manual labor.

Kinne, Charles, Private, Co. G, 108th New York Volunteers. Contusion of right parietal by a musket ball. Antietam, September 17th, 1862. Treated at the field hospital of the 3d division of the Second Corps until the 26th, and then sent to the Mount Pleasant Hospital at Washington. On November 2d, he was furloughed, and subsequently returned to duty. He was discharged from service at the regimental hospital on December 24th, 1862. Disability reported as "total," by Assistant Surgeon William Ely, 108th New York Volunteers. He was pensioned, and reported by Pension Examining Surgeon H. M. Montgomery, of Rochester, New York, January, 1863, as having had a series of pieces of bone exfoliated. Doctor Montgomery

states that the wound was then discharging pus, but that the patient would probably be free from disability in a few months, and that he appeared "fat and hearty." In November, 1865, Pension Examining Surgeon J. K. Hyde reported that this pensioner complained of increase of pain and dizziness on attempting to labor, and that he had applied for an increase of his pension, in a letter from Lancaster, Wisconsin; but no disability except dizziness is certified to. In the army such applicants are regarded as malingerers; but in the civil service a greater latitude prevails.

Liggitt, W. B., Private, Co. G, 18th Mississippi Infantry, received a gunshot wound of the scalp in the right parietal region. He was admitted into the Howard Grove Hospital, Richmond, May 27th, 1864. Exfoliation of the outer table of the bone resulted. On July 4th, he was furloughed.

Lipscomb, W. A., Sergeant, Co. C, 5th South Carolina Regiment, was admitted, on June 23d, 1864, to the Confederate Hospital at Farmville, Virginia, with a gunshot injury of the right supra orbital region. Gradual exfoliation of the external table followed. The patient was furloughed on July 8th, 1864.

Marsh, George H., Private, Co. I, 14th New York Artillery, aged 18 years. Contusion of left parietal, near lambdoidal suture, denuding bone of periosteum. Petersburg, March 25th, 1865. Treated at Mount Pleasant Hospital, Washington; White Hall, Pennsylvania; and was discharged from service June 19th, 1865. In November, 1869, Pension Examining Surgeon J. G. Pitts reports that a fragment of the external table had been exfoliated, and the pensioner alleged that he suffered dizziness when he stooped at work, and he suffered a stinging sensation in hot weather. Dr. Pitts rated the disability at one-quarter, and probably temporary.

Maxwell, Thomas, Private, Co. K, 5th Michigan Volunteers, received, at the battle of Fredericksburg, Virginia, December 13th, 1862, a gunshot injury of the right side of the cranium, anterior portion. He was, on December 10th, 1862, admitted to the Third Division Hospital at Alexandria. A portion of the outer table exfoliated, otherwise the case progressed favorably, and the patient was returned to duty on May 29th, 1863. His name does not appear on the Pension List.

McGuire, John, Private, Co. G, 65th New York Volunteers. Gunshot contusion of the frontal bone. Antietam, September 17th, 1862. Treated at Carver Hospital, Washington. Exfoliation of both tables of the frontal resulted, and the patient suffered from neuralgia. He was discharged from service on October 21st, 1862. His name does not appear on the Pension Rolls.

McNichols, William, Private, Co. K, 69th Pennsylvania Volunteers, aged 28 years. Contusion of the left parietal by a fragment of shell, which lacerated the scalp for three inches or more. Gettysburg, July 2d, 1863. Treated at Mower Hospital, Philadelphia. On August 14th, an exfoliation of the outer table was removed, and the patient recovered and was returned to duty on December 16th, 1863. Case reported by Acting Assistant Surgeon R. H. Longwill. The man's name is not on the Pension Roll.

Patterson, Elias, Private, Co. I, 7th Kentucky Volunteers, received, in the engagement before Vicksburg, Mississippi, May 22d, 1863, a gunshot contusion of the cranium. He was taken to a field hospital, and, on June 3d, was admitted to the hospital steamer R. C. Wood. On June 8th, he was sent to the Union Hospital, Memphis, Tennessee. Three or four small pieces of the external table of the cranium came away by exfoliation. He was returned to duty by Surgeon J. D. Brumley, U. S. V. On August 20th, he was sent to Fort Pickering, Tennessee, and was there discharged from service, on September 21st, 1863, his disability being rated at one-half; Surgeon Daniel Stahl, 7th Illinois Cavalry, certifying that the portion of the occipital removed was two inches long and half an inch wide, and that dimness of sight and various nervous affections followed the injury, and that the soldier was not fit for the Veteran Reserve Corps. Patterson is pensioned at four dollars per month.

Scanlan, John, Private, Co. D, 164th New York Volunteers, aged 33 years, was hit, at the battle of North Anna, May 18th, 1864, by a fragment of shell, over the middle of the left lambdoidal suture. Treated at field hospital of 3d division, Second Army Corps, Carver Hospital, Washington, and Mower Hospital, Philadelphia. At the latter hospital the wound reopened, and several exfoliations of the outer table came away. On August 25th, this soldier was returned to duty by Surgeon J. H. Hopkinson, U. S. V. He was discharged July 17th, 1865, and pensioned from that date. On January 16th, 1866, Pension Examining Surgeon J. E. King reported that his disability was permanent, and that he had dizziness and pain in the head, especially when in a stooping posture, and that he could not endure the sunlight.

Sheffler, John, Private, Co. D, 45th Pennsylvania Volunteers, aged 44 years, received, at the battle of Cold Harbor, Virginia, June 3d, 1864, a gunshot flesh wound of the head. He was on the same day admitted to the hospital of the 2d division, Ninth Corps, on June 10th, sent to the Emory Hospital, Washington, D. C., on April 9th, sent to the Cuyler Hospital, Philadelphia, and, on May 10th, transferred to the Mower Hospital, where he was discharged from the service on June 22d, 1865, on account of gunshot contusion of the cranium. Pension Examining Surgeon Edward Smith reports, July 20th, 1865, that the ball injured the frontal and right parietal bones, and that several exfoliations of bone had been removed; that the patient complained of constant headache and dizziness, and the examiner rated his disability at "three-fourths, and probably permanent."

Soloman, W. S., Private, Co. G, 66th North Carolina Regiment, was, on June 20th, 1864, admitted to the Confederate Hospital at Farmville, Virginia, with a gunshot injury of the frontal bone, received on June 18th, 1864. Gradual exfoliation of the outer table took place, but the patient did well, and was, on July 8th, 1864, furloughed.

Stafford, Benjamin, Private, Co. I, 26th New York Volunteers, was admitted to the Fairfax Seminary Hospital, Virginia, September 29th, 1862, with a gunshot wound over the right side of the frontal bone, received at Antietam. He was returned to duty May 8th, 1863. It was found, however, that the outer table of the os frontis was exfoliating, and the man was discharged from the service on May 28th, 1863. He was examined at Utica for a pension, by Dr. H. B. Day, April 22d, 1864. It was found that two fragments of bone had exfoliated, and that there was a fistulous sinus through which detached bone could still be felt.

Watson, del.

J. Bien, lith.

2. Private Walter Wheeler, Co B, 91 New York Vol.
1. Corporal Ansell H. Beam, Co I, 26 Michigan Vol.
3. Private Pembroke Scott, Co D, 93d Penn.a Vol.
4. Private Denis Sullivan, 2 Virginia Cavalry.

GUNSHOT SCALP WOUNDS AND CONTUSIONS OF THE SKULL.

Scott, Pembroke, Private, Co. D, 198th Pennsylvania Volunteers, aged 25, was wounded, in an engagement at Gravelly Run, Virginia, March 29th, 1865, by a conoidal ball, which inflicted a wound in the scalp, three inches in length, across the left temporal and edge of the left parietal bone, and contused the outer table of the latter. He was conveyed to the field hospital of the 1st division, Fifth Corps, and thence was transferred to City Point, Virginia, where he remained in the depot field hospital of the Ninth Corps until the 2d of April, when he was transferred to the Harewood Hospital, Washington, D. C. By April 29th, the wound was doing well and healing kindly, and there were no indications of depression nor compression. On May 15th, he was transferred to the Satterlee Hospital, Philadelphia, Pennsylvania. On June 16th, several small pieces of the outer table of the skull were removed. The patient improved gradually, and was, on the 6th of July, 1865, discharged from service. The appearance of the wound, while the man was at Harewood Hospital, is exhibited in the third figure of Plate III. Scott was pensioned to date from July 5th, 1865. In April, 1866, Pension Examining Surgeon Wilson Jewell reported that the man's nervous system was much affected, and that loss of memory and partial aphasia were especially noticeable. Dr. Jewell regarded the disability as permanent.

Tree, Franklin, Private, Co. A, 20th Maine Volunteers. Contusion and denudation of the vault of the skull for one inch by a musket ball. Gettysburg, July 3d, 1863. Treated at Seminary and Satterlee Hospitals. A scale of bone exfoliated. The wound then healed, and the man was returned to duty October 23d, 1863. His name is not on the Pension Roll.

Whitmer, B. M., Captain, Co. G, 3d South Carolina Battalion, received, at the battle of Gettysburg, Pennsylvania, July 2d, 1863, a gunshot scalp wound, with contusion of the cranium. He was admitted to the Confederate Hospital No. 10, Richmond, Virginia. Exfoliation of the external table of the bone took place. Captain Whitmer was furloughed on July 20th, 1863.

Wilson, J. P., Lieutenant, Co. B, 9th Virginia Regiment, received, at the battle of Spottsylvania Court-house, Virginia, May 10th, 1864, a gunshot injury of the left parietal bone. The wound of the scalp was about two inches in length. He was, on May 24th, admitted to the Confederate hospital at Farmville, Virginia. An exfoliation of the bone took place, otherwise the case progressed favorably, and the patient was furloughed on July 1st, 1864. He was readmitted on October 1st, 1864, suffering from acute dysentery and icterus, and returned to duty on October 29th, 1864, by Surgeon H. D. Taliaferro, C. S. A., the medical officer in charge of the general hospital at Farmville. The injury of the head gave no further trouble.

Wilson, Jarvis C., Sergeant, Co. I, 10th Wisconsin Volunteers, aged 21 years. Contusion of the occipital by a conoidal musket ball, which lodged beneath the scalp below the semi-circular ridge. Kenesaw Mountain, Georgia, June 29th, 1864. The missile was extracted on the field by Assistant Surgeon R. G. James, 10th Wisconsin Volunteers. Treated at Totten Hospital, Louisville, till August 26th, at Harvey Hospital, Madison, Wisconsin, till October 25th, and then sent to Milwaukie to be mustered out. Pension Examiner C. F. Falley reports, May 24th, 1869, that there had been exfoliation of the external plate of the occipital, and that the muscles inserted into the curved lines of the occipital were indurated and contracted. The head was drown backward somewhat, and the pensioner alleged that bending it forward caused dizziness and pain. He was totally disabled for manual labor; but Doctor Falley thought that he would ultimately improve.

Fig. 30.—Exfoliation from the parietals following gunshot contusion. *Spec.* 5587, Sect. I, A. M. M.

Gilkey, Francis W., Private, Co. K, 10th Pennsylvania Reserves, was wounded in one of the earlier battles of the war, and made a prisoner. In January, 1863, he was exchanged, and received at the Annapolis General Hospital. He had, to the right of the vertex, a large ulcer, resulting from a gunshot wound of the scalp, extending over the sagittal suture. The skull was necrosed, and probably there had been denudation, with contusion of the bone. Erysipelas supervened, followed by gangrene. When this was arrested, exfoliation took place, and the brain was exposed. The fragment of the skull exfoliated is represented in the adjoining woodcuts (Figs. 30 and 31), copied at natural size from the specimen forwarded by the attending physician, Dr. A. V. Cherbonnier. Granulations sprang up, the wound closed, and the patient recovered without any further complications. He was discharged from service on January 29th, 1863. His name does not appear on the Pension Rolls.

Fig. 31.—Interior view of the foregoing specimen.

Hay, John W., Private, Co. D, 61st Pennsylvania Volunteers, aged 29 years, was wounded, at the battle of Spottsylvania, Virginia, May 11th, 1864, by a conoidal ball, which struck obliquely about the middle of the forehead. He was admitted to the hospital of the 2d division, Sixth Corps, but the injury must have been considered slight, as no record of the case was found until July 12th, when the patient was admitted to Mount Pleasant Hospital, on account of a gunshot scalp wound near the occipital protuberance, subsequently received in General Early's demonstration against the defences of Washington, the day of the patient's admission. Gangrene attacked this later wound. Bromine, nitric acid, yeast, and charcoal poultices were successively applied to the gangrenous wound. The sloughing was checked, and the wound soon assumed a healthy appearance. The wound on the forehead was not affected by gangrene, and was supposed to be trifling, and was treated with simple dressings. A month after his admission, the man complained of some pain in the forehead. Ice water was applied, and morphia was given internally. Death occurred a few hours afterwards. On August 7th, 1864, at the *post mortem*

examination, the brain was found to be slightly congested, but no pus was observed between the skull and dura mater; yet the latter was detached from the inner table of the skull, which was carious over a surface nearly as large as the surface of the incipient exfoliation on the outer table. The scale of dead bone of the outer table remained in siter. The dura mater opposite the diseased inner table was thickened and had deposits of lymph on the surface next the cranium; otherwise, the encephalon was normal in appearance. The specimen was contributed by Assistant Surgeon C. A. McCall, U. S. A., and is represented in the foregoing wood-cuts, FIGS. 32 and 33. The notes of the case were furnished by Acting Assistant Surgeon F. J. Kern.

FIG. 32.—Segment of os frontis, showing necrosis following a gunshot contusion. *Spec.* 2964, Sect. I, A. M. M.

Fig. 33. Internal view of the same specimen, showing the diseased dura mater and the ulceration of the inner table.

Caries.—Gunshot contusions of the cranial bones were succeeded, in three instances, by caries. This complication, common enough in tertiary syphilis, mercurio-syphilis, and scrofula, rarely occurs as a result of injury, unless there is some constitutional taint. There is no evidence, however, that any such vice of system existed in the cases of which abstracts are subjoined. The energetic treatment advised by authors,* such as applications of the rugine or trepan, the actual cautery, or chloride of zinc, red oxide of mercury, and other potent escharotics, were not employed in any of these cases.

PRICE, WILLIAM, Private, Co. H, 8th Tennessee Infantry, aged 39 years, received, in the engagement near Atlanta Georgia, August 8th, 1864, a slight injury of the left parietal bone, and also a flesh wound of the leg. He was taken to the field hospital of the 23d Corps, and, on August 15th, was admitted to the Asylum Hospital, Knoxville, Tennessee. No account of the treatment is recorded. He was discharged from the service on June 20th, 1865, and pensioned from that date. On March 1st, 1869, Pension Examining Surgeon R. P. Mitchell reports that this man was living at Rogersville, Hawkins County, Tennessee; that he had caries of the skull, bits of bone passing out in the purulent discharge. The wound was still open and suppurating five years subsequent to the injury, and the man was utterly unable to perform manual labor, or to bear exposure to the sun's rays.

Robinson, J. A., Private, Co. B, 7th South Carolina Battalion, received, on June 18th, 1864, a gunshot contusion of the right parietal and right side of the frontal bone. He was admitted, on June 20th, to the hospital at Farmville, Virginia. The wound resulted in extensive ulceration of bone. The patient was furloughed July 19th, 1864, by Surgeon H. D. Taliaferro, C. S. A.

Vaughan, George W., Assistant Surgeon, Tennant's Battery, received, at the siege of Atlanta, Georgia, August 19th, 1864, a wound of the head from a fragment of shell. The scalp was lacerated and the cranium contused, and caries of the occipital resulted. He was recommended for furlough, October 11th, 1864, by a medical examining board.

Persistent Pain in the Head.—Ten instances are found in the reports of cases of gunshot contusions of the skull, in which persistence of pain, either in the cicatrices or in distinct spots of the cranium, constituted the prominent symptom. Some of them belong to the class of cases described by Quesnay.† All of these patients were spared incisions of the scalp, or the application of the rugine or trephine; and five recovered and went to duty, while five were discharged for disability, two of whom were subsequently pensioned.

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* BOYER, *Dictionaire des Sciences Médicales*, T. vii, p. 283, Paris, 1813; PIRRIE, *The Principles and Practice of Surgery*, London, 1860, p. 381; SÉDILLOT, *Traité de Médecine Opératoire*, Paris, 1865, T. ii, p. 3; FANO, *Traité Élémentaire de Chirurgie*, Paris, 1869, T. i, p. 684. The latter author even advises the ablation of the entire bone, citing Lapeyronie's case of removal of the whole frontal, and suggests the gouge and chisel and mallet as suitable instruments.

† QUESNAY. *Mémoires de l'Académie Royale de Chirurgie*. Nouv. ed., Paris, 1819, T. I, p. 169.

BRUNNELLO, PIETRO, Private, Co. F, 55th New York Volunteers. Gunshot contusion of the vertex of the cranium by a fragment of shell, with much laceration of the scalp. Malvern Hill, Virginia, July 1st, 1862. Treated at Carver Hospital, Washington, and returned to duty August 13th, 1862. On November 12th, 1862, he was admitted to Episcopal Hospital, Philadelphia, under the care of Doctor W. S. Forbes. He was suffering from severe local pain at the seat of injury. He was discharged from the service on February 25th, 1863. His name does not appear on the Pension Roll.

EPENETER, CHARLES J., Captain, 7th United States Colored Artillery, received, at the capture of Fort Pillow, Tennessee, April 12th, 1864, a gunshot wound of the anterior portion of the temporal ridge of the right parietal bone. At the end of four months the wound had closed, but it opened again spontaneously several times. There was always more or less pain extending backwards from the seat of injury, nearly parallel with the median line. With every change to bad weather the pain would become intolerable, and exposure invariably aggravated it. Captain Epeneter resigned on March 16th, 1865.

HANTS, ENOCH W., Private, Co. C, 9th New Jersey Volunteers, aged 23 years, was wounded, at the battle of Kinston, North Carolina, December 14th, 1862, by a conoidal musket ball, which apparently only involved the scalp. He was admitted to the Stanley Hospital at Newberne on the 20th, whence he was furloughed and sent north in February, 1864. On the 8th of April, 1864, he was admitted into the Balfour Hospital, Portsmouth, Virginia, still suffering from the wound in the head. In the latter part of April he was transferred by steamer to the De Camp Hospital, in New York Harbor, where the case is reported as a contusion of the skull. He was returned to duty on May 27th, 1864, but was again admitted to the Hampton Hospital, Fort Monroe, on June 11th, 1864, suffering from cephalalgia. On June 21st, he was transferred to the Mower Hospital at Philadelphia, and finally sent to Trenton, New Jersey, on September 22d, 1864, to be mustered out of service. His name does not appear on the Pension List.

HAYES, WILLIAM A., Private, Co. A, 28th Massachusetts Volunteers, received a slight wound of the scalp by a fragment of shell, with contusion of the skull over the sagittal suture. Fredericksburg, December 13th, 1862. Treated at Point Lookout till May 1st, 1863, West's Building, Baltimore, till May 9th, Lovell Hospital, Rhode Island, till October 7th, 1863, when he was transferred to the 2d Battalion of the Veteran Reserve Corps. He suffered greatly from pain in the cicatrix, which, on May 13th, 1867, was reported by the pension examiner to be very sensitive on pressure. It was particularly painful in warm weather and after exposure to the sun.

KING, SAMUEL, Private, Co. H, 49th Pennsylvania Volunteers, aged 33 years, received, at the battle of Cold Harbor, Virginia, June 4th, 1864, a severe wound of the left side of the scalp by a conoidal musket ball. He was admitted into the Soldiers' Rest Hospital at Alexandria, June 6th, and a few days later sent to Philadelphia, and admitted, on June 16th, into the 16th and Filbert streets Hospital. On July 16th, he was sent to the Satterlee Hospital. He suffered from constant pain in his head. The wound healed gradually. On September 29th, he was transferred to Camp Curtin at Harrisburg, and, on October 6th, 1864, returned to duty. The case is reported by Surgeon I. I. Hayes, U. S. V.

Lacoste, S. D. M., Sergeant, Co. K, 23d South Carolina Regiment, was admitted to the South Carolina Hospital, Charlottesville, Virginia, September 6th, 1862, with a gunshot injury a little to the left of the median line and midway between the eye and the root of the hair. There was an indentation of the bone, but no perceptible fracture. The periosteum was gone to the extent of about one square inch. No operation was performed. In July, 1863, the man was at his home, not yet recovered, and suffering constantly with intense pain in the head, regretting that he had not been operated upon. The case is reported by Assistant Surgeon B. W. Allen, P. A. C. S.

MARSHALL, JAMES, Private, Co. H, 28th Pennsylvania Volunteers, received, at the battle of Antietam, Maryland, September 17th, 1862, a gunshot injury of the frontal bone. He was, on October 30th, 1862, admitted to the Carver Hospital, Washington, D. C., and, on January 8th, was transferred to the Patterson Park Hospital, Baltimore. He was treated in the hospitals of the latter city for cephalalgia and neuralgia, until August 29th, 1863, when he was returned to duty.

RATE, EDWARD, Private, Co. C, 17th New York Volunteers, aged 21 years, was wounded, at the battle of Fredericksburg, Virginia, December 13th, 1862, by a fragment of shell about two inches in length, which produced a wound of the scalp on the left side of the head. He was prostrated, and, in this condition, immediately conveyed to a field hospital, where his wounds were dressed. After the troops recrossed the river, he was sent to Point Lookout, Maryland, where he was admitted to Hammond Hospital, on December 16th. He suffered for one month from a severe pain at the point struck, and also, after his entering the hospital, from a malarial fever, to which was attributed the slow manner in which the wound healed. He was transferred, on February 13th, 1863, to New York, and there admitted on the 17th, to Ladies' Home Hospital, where he remained until returned to duty on March 30th, 1863.

Russell, W. P., Private, Co. L, 6th Alabama Regiment. Gunshot contusion of the left parietal, received at the battle of Fair Oaks, May 31st, 1862. Neuralgia supervened, and constant pain in the cicatrix for a long period after the injury. The patient was examined by Surgeons Welford, Thom, and Cabell, of the Confederate service, and for a long time he was unfit for duty. He finally recovered, and returned to duty March 5th, 1863.

YOUNG, THOMAS, Private, Co. F, 17th United States Infantry, received, at the battle of Antietam, September 17th, 1862, a gunshot contusion of the vertex. Treated at Washington and Baltimore, and discharged February 14th, 1863. He was pensioned, and, in September, 1866, Pension Examining Surgeon F. P. Fitch, of Milford, New Hampshire, reported that he had continuous pain in the cicatrix, a very irritable temper, and impaired memory.

Vertigo.—Dizziness, giddiness, or vertigo, are among the commonest complaints of the pensioners who have recovered from contusions of the skull. The cases of Hastings (p. 100), of Kinne (p. 103), of Marsh, Scanlan, Sheffler (p. 104), and of Wilson (p. 105),

have been already cited. In the following cases. also, this result is specially commented on by the Surgeons from whose reports the abstracts have been compiled:

Blood, J. C., Private, Co. G, 27th Missouri Volunteers, received a contusion of the right frontal eminence by a conoidal musket ball, at the siege of Vicksburg, June 17th, 1863. He was discharged from service July 9th, 1865, and pensioned. On January 19th, 1866, he was reported by Doctor J. T. White, at Edina, Missouri, as suffering greatly from vertigo, being entirely unfit to labor at his trade of brick-laying.

Galmish, George, Private, Co. H, 150th Pennsylvania Volunteers. Gunshot contusion of the right parietal, at Gettysburg, July 2d, 1863. Treated at Gettysburg and Philadelphia, and discharged from service September 28th, 1863, and pensioned. At this date, Pension Examining Surgeon H. Lenox Hodge reports that during his treatment this man had suffered from convulsions, with much cerebral disturbance, and was then troubled with impaired vision and hearing, and had an unsteady gait and constant dizziness and vertigo, and rated his disabilities at three-fourths, and probably temporary.

Kellogg, L. M., Private, Co. B, 14th New York State Militia, aged 29 years, received, at the battle of Gettysburg, Pennsylvania, July 1st, 1863, a gunshot wound of the left occipital region by a musket ball. He was admitted into the field hospital on the same day, and subsequently transferred to New York, and admitted, on July 27th, into the Central Park Hospital. He suffered from headache and vertigo. Simple dressings were used. He gradually recovered, and was returned to duty, November 29th, 1863.

Leighton, Charles W., Corporal, Co. E, 11th New Hampshire Volunteers, aged 23 years, was wounded at the battle of Petersburg, Virginia, June 16, 1864, by a conoidal musket ball, which contused the occipital bone. He was admitted to the hospital of the 2d division, Ninth Corps, and thence conveyed to Annapolis, Maryland, and admitted, on the 20th, into the First Division Hospital. After several transfers, he was admitted into the Webster Hospital, in New Hampshire, on December 2d. On May 27th, 1865, he was discharged from service. In March, 1868, the Commissioner of Pensions reported that this man's disability was rated at one-half and permanent, and that he had been greatly troubled with vertigo since the reception of the wound.

Magness, W. A., Musician, Co. B., 5th Maryland Volunteers, aged 29 years, was wounded in front of Petersburg, July 6th, 1864, by a conoidal musket ball, which tore up the pericranium over the right parietal protuberance. Treated at field hospital of the Eighteenth Corps, Balfour Hospital, Lovell Hospital, Patterson Park Hospital, and Hicks Hospital, and discharged from service June 27th, 1865, and pensioned. On August 29th, 1869, Pension Examining Surgeon A. W. Dodge reported him as totally disabled, his suffering from vertigo and cephalalgia being aggravated by chronic diarrhœa; but his disabilities were not regarded as permanent.

Shuler, D. A., Corporal, Co. K, 2d South Carolina Infantry, received a gunshot contusion of the cranium. He was admitted into the Chimborazo Hospital, No. 3, Richmond, on February 22d, 1863. Vertigo and general debility resulted from the injury. On February 26th, he was furloughed.

Woodborne, George W., Sergeant, Co. B, 13th Ohio Cavalry, aged 31 years. Contusion of the right parietal, near the sagittal suture, by a conoidal musket ball. Deep Bottom, Virginia, August 16th, 1864. Treated at Ninth Corps Field, Beverley, and White Hall Hospitals. Discharged May 19th, 1865. In April, 1868, he was a pensioner, and his disability was regarded as permanent. Pension Examining Surgeon W. F. Sharp reported that he was much troubled with vertigo, pain in the head, and partial loss of memory.

Headache.—Ten cases are reported, in which, after gunshot contusions of the skull, headache was the most troublesome symptom. To these might be added the cases of McCarty (p. 100), and Crinyan (p. 103):

England, Samuel, Sergeant, Co. C, 9th Pennsylvania Reserves, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a buckshot, which entered about the centre of the occipital region. He was admitted to the field hospital of the 3d division, Fifth Corps, on the day of the receipt of injury, and, on the following day, was sent to the field hospital at Gettysburg, whence he was transferred, on the 7th, to Satterlee Hospital at Philadelphia. Although the patient stated that the ball was still in the wound, it healed kindly. During the progress of the case, he complained of headache. He remained in hospital until April 27th, 1864, when he was returned to duty.

Haynes, Owen, Private, Co. C, 28th Massachusetts Volunteers, aged 27 years, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal musket ball, which divided the scalp in the right occipital region for a distance of two and a half inches, grazing the skull. He was at once admitted to the hospital of the 1st division, Second Corps, and, on June 11th, sent to the Turners Lane Hospital, Philadelphia. His general health was good, but he suffered considerable pain in the head. The wound, which gaped very much, healed gradually, the headache ceased, and, on September 11th, 1863, the patient was returned to duty. The case is reported by Acting Assistant Surgeon David Burpee.

Helmreich, Peter, Private, Co. A, 44th Illinois Volunteers, aged 29 years, received, at the battle of Peach Tree Creek, Georgia, July 20th, 1864, a gunshot contusion of the right parietal region. He was admitted into the field hospital of the 2d division, Fourth Corps, on the same day, and, a few days later, was sent to the general field hospital. On July 27th, the patient was sent to Nashville, and admitted into the Cumberland Hospital. On August 6th, he was transferred to Louisville, and admitted into the Brown Hospital, and, subsequently, to the Mound City Hospital, in Illinois. The wound was discharging, and he had occasional headache. On September 24th, he was admitted into the general hospital at Quincy. He was discharged from service, June 10, 1865. The case is reported by Surgeon Horace Wardner, U. S. V. The name of this patient does not appear on the Pension List.

LAKE, JOSHUA, Sergeant, Co. B, 2d Delaware Volunteers, aged 19 years, received, at the battle of Antietam, Maryland, September, 17th, 1862, a gunshot contusion of the right parietal. He was admitted, on September 24th, to Walnut street hospital, at Harrisburg, and, from there, transferred on the 27th, to Philadelphia, where he was first admitted to Race street hospital, and there remained until January 14th, 1863, when he was transferred to Mower Hospital. During the progress of the case, the patient complained of headache, the cause being attributed to the wound. On February 2d, a part of the ball, still remaining lodged, was removed, after which he did well, and, on the 25th of the same month, was able to do light duty, in the performance of which he was engaged at the latest report.

LAUGHLIN, JOSIAH D., Private, Co. G, 91st Ohio Volunteers, aged 16 years, was wounded in an engagement at Winchester, Virginia, July 20, 1864, by a revolver ball, which contused the skull at the junction of the sagittal and lambdoidal sutures. He was admitted into the hospital at Cumberland, Maryland, July 23d. There was cephalalgia and slight impairment of audition. The wound healed rapidly under the application of simple dressings, and the patient was returned to duty, August 18, 1864.

McClung, George W., Private, Co. G, 12th Virginia Volunteers, aged 22 years, was wounded, March 6th, 1864, by a pistol ball, which entered the scalp near the intersecting angle of the frontal, parietal, and temporal bones on the left side, and made its exit four inches above the meatus auditorious externus, two inches from point of entrance, and contused the skull. Admitted to Cumberland hospital, Maryland. He had headache and ringing in the ear, which continued for some days. He was returned to duty. May 26th, 1864.

MOAKLY, E., Private, Co. A, 14th New York State Militia, aged 26 years, received, at the battle of Gettysburg, Pennsylvania, July 1st–3d, 1863, a gunshot contusion of the skull. He was, on July 6th, admitted to the Cuyler Hospital, Germantown, Pennsylvania. The injury was painful and caused much headache, and at times the patient was delirious. In a few weeks the wound began to heal, and in September it had closed. The patient was returned to duty on February 10th, 1864, but he still complained of much headache after exertion. The case is reported by Acting Assistant Surgeon C. R. Prall.

Nason, Alexander, Corporal, Co. C, 1st Alabama Artillery, aged 28 years, was wounded, at the capture of Fort Pillow, Tennessee, April 12th, 1864, by a conoidal musket ball, which struck the right side of the head, immediately above the ear, contusing but not fracturing the bone. He was, on April 14th, admitted to the hospital at Mound City, Illinois, and for weeks he suffered from headache, restlessness, and fever. On May 18th, he had entirely recovered, and, June 23d, 1864, he was returned to duty.

SPURR, WILLIAM E., Sergeant, Co. A, 56th Massachusetts Volunteers, aged 23 years, received, in an engagement before Petersburg, Virginia, June 17th, 1864, a gunshot contusion of the skull. He was taken to the hospital of the 1st division, Ninth Corps, and, on June 30th, sent to the Mount Pleasant Hospital, Washington, where he was treated for concussion of the brain. On July 22d, he was transferred to the Mower Hospital, Philadelphia, Pennsylvania. He was then suffering from headache. He was discharged from the service on January 30th, 1865, on account of phthisis pulmonalis. His name does not appear on the Pension List.

WEISS, FRANCIS S., Private, Co. F, 54th Pennsylvania Volunteers, aged 27 years, was wounded, in an engagement near Piedmont, Virginia, June 5th, 1864, by an explosive musket ball, which tore a triangular flap, horizontally, about two inches in length and one inch above the occipital protuberance, and contused the bone. The wound was first dressed, on June 7th, by Assistant Surgeon Reuben Hunter, 54th Pennsylvania Volunteers, who extracted five or six fragments of the ball, which were imbedded beneath the integument, and applied cold water dressings. He was admitted into hospital at Cumberland, Maryland, on June 20th, and on June 23d the wound was nearly cicatrized; suppuration had ceased, and the general symptoms were good, with the exception of an occasional headache. The patient's appetite and digestive powers were unimpaired. On July 20th, he left the hospital on furlough, but, not returning, was reported as a deserter, August 3d, 1864. His name does not appear on the Pension Rolls.

Chronic Irritability of the Brain.—The cases of Hefler (p. 100), and of Lusk (p. 102), and several of those of which abstracts are given further on, under the heading *Mental Aberration*, were examples of that condition described as cerebral irritation, characterized at the outset by restlessness and a general tendency to persistent flexion of the voluntary muscles, with contraction of the pupils, cool surface, feeble and slow pulse, and mental irritability, and, subsequently, by mental decay or complete fatuity, by paralysis or epilepsy. This condition has been supposed to be associated with lacerations of the gray matter of the brain. The following case was regarded as an example of this pathological condition at the time, though the autopsy proved that it was accompanied by grave structural lesions:

FARNHAM, NOAH L., Colonel, 11th New York Volunteers (1st Fire Zouaves), was wounded, at the battle of Manassas, July 21st, 1861, by a musket ball, which made a superficial forward wound over the left parietal. He was much stunned, and fell from his horse. He was conveyed to the E Street Infirmary, Washington, and placed under the care of Assistant Surgeon W. J. H. White, U. S. A. The wound healed promptly, and his condition was hopeful until August 10th, when grave cerebral symptoms appeared, terminating in hemiplegia, followed by coma and death on August 14th, 1861. At the autopsy,

made by Assistant Surgeon J. W. S. Gouley, U. S. A., an abscess, the size of an English walnut, was found at the seat of injury, with extravasation of blood in the neighboring sulci of the brain. The following description of this case was prepared by Surgeon John A. Lidell, U. S. V.:*

* * * "It cannot be doubted that, in at least some instances, this ecchymosis, this extravasation of blood beneath the visceral arachnoid membrane into the meshes of the pia mater (connective tissue), denotes a genuine contusion of the brain or spinal cord, as the case may be; and that, in this way, a positive pathological lesion, perceptible to the unaided vision, is superadded to the concussion. These cases of concussion, complicated with contusion of the nerve tissue, when the cerebrum happens to be the part involved, exhibit a marked tendency to the occurrence of meningo-cerebral inflammation and cerebral abscess. The following case strongly corroborates this statement: * * Colonel Farnham, of the New York City Fire Zouaves, was wounded, at the battle of Manassas, July 21st, 1861, by a spent ball, which hit his head and knocked him off his horse. He was picked up insensible. The wound was small in size, superficial in character, and situated on the left side of the head, three inches above the meatus auditorius. It healed without any difficulty. The principal symptoms in his case, until near the close, were referable to concussion and irritation of the brain. He died on the evening of August 14th, twenty-four days subsequent to the infliction of the injury. It was thought that he would recover, until about four days before death. He was partially paralyzed on the right side (hemiplegia) toward the last. He was comatose in the last moments. At the autopsy, made August 15th by Doctor Gouley, U. S. A., we found that the external wound was superficial; that the skull was not injured; that there was copious subarachnoidian effusion; that there was an unusual quantity of yellow-colored serum in the ventricles, and that there was an abscess of the cerebrum, situated directly beneath the wound of the scalp. This abscess was about the size of an English walnut, superficial in situation, and surrounded by softened cerebral tissue. The visceral and parietal arachnoid over the abscess were glued together, to some extent, by adhesive inflammation, so that, in endeavoring to turn back the dura mater while making the autopsy, though it was carefully done, the abscess was torn open. There were also traces of an extravasation of blood, three or four weeks old, in the sulci of the brain, beneath the visceral arachnoid membrane over the seat of the abscess, and likewise at the anterior extremity of the left cerebral hemisphere. There was a flattened clot of blood, black in color, and apparently three or four weeks old, in the fossa, at the base of the middle lobe of the left cerebral hemisphere. The dura mater, in relation with it, was somewhat thickened, roughened, and opacified." * * *

Medical Inspector F. H. Hamilton, U. S. A., has described this case as follows:†

"First, I would remark, that you may have an injury of the scalp of an exceedingly trivial character, which may, in the end, prove fatal. A ball may simply tear off the hair of the scalp, and create a very slight abrasion of the skin, yet, the bone being so near, and the brain so close to the bone, it is very probable that serious mischief has been done. The bone in that situation may be so injured as to lead to necrosis, or a sufficient shock may be given to the brain and its envelopes to bring on inflammation. I will mention a very remarkable illustration of this fact. Colonel Farnham, after the death of Colonel Ellsworth, took command of the 1st Zouave Regiment. At the battle of Bull Run, July 21st, 1861, he received an injury of the character referred to, and which I examined myself. It was a very slight and superficial wound, which seemed to have taken off very little more than the hair. He was transferred from the field to the Washington Infirmary, where he was reported as doing very well, the wound being considered as a very slight and insignificant one; but, notwithstanding all this, he kept his bed. He did actually seem to be improving until about the ninth day after the reception of the wound, when grave symptoms suddenly supervened, and, in a day or two after, he died. I should notice that, during all the time he was in the hospital, he was very easily disturbed by visitors, and it was his desire to be left alone, showing that there was some cerebral disturbance. I ought also to mention that he was ill before he received the wound, and was unfit to perform duty at the time the battle took place; but, being a gallant officer, he was determined to lead his regiment to the charge. But his previous condition I do not think had much, if anything, to do with his death, which, in my opinion, and in the opinions of many other surgeons who saw him, was due directly to the apparently slight wound which he received during the fight." * * "Next, I called your attention to those injuries of the scalp produced by smaller missiles; for example, where a rifle ball had slightly impinged upon the surface of the scalp, producing a slight abrasion of the integument, which accident is usually accompanied by some degree of concussion, either to the skull, to the meninges of the brain, or to the brain itself, and which I have said you are not to regard as trivial accidents. Although the patient may not seem to have suffered any severe injury, you are to anticipate that sooner or later there may be an ulceration along the track of the ball, or that there may result necrosis, or meningitis, or cerebritis, and that the patient may ultimately die. And I cited, as an illustration of injuries of this class, the case of Colonel Farnham, who assumed command of the Ellsworth Zouaves after the death of Colonel Ellsworth. He received an injury of such a character, which was exceedingly slight and superficial. I saw him myself, and examined him particularly, and all that was visible was a very trivial scalp wound. He was taken into a hospital in Washington, and there I saw him again, at the expiration of seven or eight days. He was then very irritable, and had been quite ill, but still his friends all thought that his recovery was certain. Three or four days after this, if I remember correctly, the symptoms became more grave, and he died, evidently from the injuries which his brain had received." * * *

Meningitis.—This formidable affection was one of the most common causes of death after gunshot contusion of the cranium:

CUTTING, A. H., Private, Co. K, 13th Massachusetts Volunteers, was wounded, at the battle of Gettysburg, July 2d, 1863, by a conoidal musket ball, which caused a contusion of the frontal bone, just above and external to the right parietal eminence. He was admitted to Camp Letterman, and thence was sent to the McDougall Hospital, New York, on July 12th. Meningitis supervened, and death ensued on July 30th, 1863, twenty-seven days from the reception of the injury. The specimen

* *American Journal of the Medical Sciences*, vol. xlviii, p. 323. † *American Medical Times*, vol. viii, pp. 73–85.

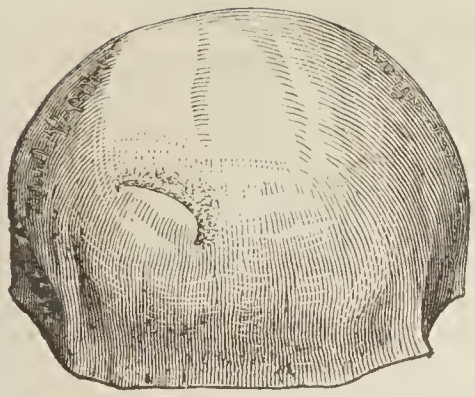

FIG. 34.—Results of contusion of the frontal bone by a conoidal ball, twenty-seven days after the injury. *Spec.* 1660, Sect. I, A. M. M.

is copied in the adjacent wood-cut (Fig. 34). The injured portion of the external table is porous and spongy, and a small scale of bone was evidently in process of exfoliation. The internal table shows no trace of injury beyond the most trivial discoloration. The specimen and notes of the case were contributed by Acting Assistant Surgeon A. E. M. Purdy.

JOHNSON, C. R., Captain, Co. F, 16th Massachusetts Volunteers, received, at Gettysburg, July 2d, 1863, a scalp wound from a minié ball, which produced a contusion of the cranium. He was taken to the field hospital of the 2d division of the Third Corps, when meningitis supervened, and he died on July 17th, 1863.

LARKINS, DANIEL, Private, Co. H, 188th Pennsylvania Volunteers, aged 19 years, received, at the battle of Cold Harbor, Virginia, June 3d, 1864, a gunshot scalp wound, with contusion of the left parietal. He was carried to the hospital of the Eighteenth Corps, and, on June 6th, was transferred to the Harewood Hospital at Washington, and thence, on June 11th, to the convalescent hospital, Philadelphia, where he died, on June 26th, 1864, from meningitis, following the wound of head.

MORRIS, JAMES, Private, Co. I, 150th Pennsylvania Volunteers, was admitted, on July 12th, 1863, to the McDougall Hospital, Fort Schuyler, New York, with compression of the brain, following a gunshot wound of the scalp, with contusion of the skull. He died on July 18th, 1863.

THURMAN, C., Private, Co. E, 42d Pennsylvania Volunteers, was, on May 30th, 1863, admitted to a hospital in Richmond, Virginia, with a gunshot wound of the scalp, involving the cranium. He died on January 7th, 1864, of pneumonia and meningitis.

WATERMAN, WILLIAM A., First Sergeant, Co. H, Michigan Cavalry, aged 27 years, was wounded, in the action at Salem Church, Virginia, May 28th, 1864, by a conoidal musket ball, which struck the frontal region and laid the bone bare for one inch. He was admitted into the field hospital of the 1st division, cavalry corps, on the same day. The patient was transferred to the Mt. Pleasant hospital, Washington, on June 1st. Simple dressings were used. Meningitis supervened, and death resulted June 14th, 1864. Assistant Surgeon C. A. McCall, U. S. A., reported the case.

WRIGHT, HARRISON, employed in the Quartermaster's Department, aged 45 years, was wounded, July 15th, 1864, by a fragment of shell, which injured the scalp and contused the skull. He was, on August 15th, admitted to the hospital for colored troops at City Point, Virginia, and. on August 17th, was transferred to the Satterlee Hospital, Philadelphia, where meningitis supervened, from which he died on August 26th, 1864.

Encephalitis.—The following cases were recorded, in which the fatal results were due to inflammation of the brain following gunshot contusions of the skull. Other examples will be found among the cases classified further on:

BOWDLE, CHARLES W., Co. K, 1st Ohio Volunteers, received, at the battle of Stone river, Tennessee, December 29th, 1862, a gunshot wound, with contusion of the vault of the skull. He was admitted into the No 1 Hospital, Nashville, on January 9th. Death resulted April 2d, 1863, from inflammation of the brain.

KENNEDY, THOMAS, Private, Co. M, 1st Massachusetts Heavy Artillery, aged 30, was wounded, at the battle of Petersburg, Virginia, June 16th, 1864, by a conoidal pistol ball, which contused the right parietal bone, near the right descending branch of the lambdoidal suture. He was conveyed to Washington, and admitted, on the 21st, into the Lincoln Hospital. Simple dressings were applied, as the injury was considered slight. He was furloughed on July 16th, but returned on the 29th of the same month. He stated that during his absence from the hospital he had suffered from ague, and, for the last ten days, had experienced a chill daily. A careful examination of the wound was now made, and a roughness of the external table of the skull was detected. He was much prostrated, but complained of no pain or uneasiness about the head. His pulse was frequent and feeble. tongue dry and red, and the abdomen tympanitic and painful. Three grains of calomel, with one-fourth of a grain of opium, were ordered every three hours, until the third dose had been taken; meantime, tonics and stimulants were given, and afterwards continued in liberal doses. Sinapisms were applied to the epigastric region and extremities. No perceptible improvement in his condition, however, was obtained. He died on the afternoon of the 31st, remaining fully sensible and able to answer questions intelligently until within two or three hours of his death. At the autopsy, the seat of injury was found to be near the middle of the posterior edge of the right parietal bone. The missile had glanced downward and forward, and was found lying against the skull, two inches from the point of injury. The pericranium was separated a distance of three and three-quarter inches along the track of the missile, and beneath it the bone was spongy and porous. The line of separation from healthy bone was well-marked. Upon the removal of the skull-cap, a slight sponginess of the internal table, beneath the point of impact, was observed. (See FIG. 35.) The meninges, for some distance around the seat of injury, were very much thickened and blackened, and firmly adherent to the calvaria. The brain substance was softened, and the vessels very much congested. The heart, liver, and spleen were flabby. The case is reported by Acting Assistant Surgeons Dean and Atwater.

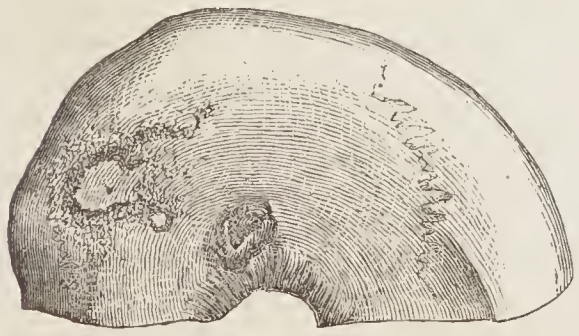

FIG. 35.—Showing the extent of necrosis in a calvaria sixteen days after a gunshot contusion. *Spec.* 2920, Sect. 1, A. M. M.

REIMER, WILLIAM, Private, Co. B., 16th New York Heavy Artillery, aged 44 years, was wounded, at Fort Fisher, North Carolina, January 15th, 1865, by a conoidal musket ball, which contused the frontal and temporal bones. He was taken on board an hospital steamer, and conveyed, on January 24th, to the McDougall Hospital, New York Harbor, where he died, on February 9th, 1865, from inflammation of the brain.

SHERRON, THOMAS, Private, Co. A, 15th Virginia Volunteers, aged 20 years, received, at the battle of Hatcher's Run, Virginia, March 31st, 1865, a gunshot contusion of the cranium. He was admitted to the hospital of the 2d division of the Ninth Corps, and, on April 3d, was sent to the hospital at Fort Monroe, Virginia. Death occurred on April 16th, 1865, from meningitis and encephalitis.

SUNDAY, JACOB C., Corporal, Co. C, 34th Illinois Volunteers, was, on May 9th, 1864, admitted to hospital No. 1, Chattanooga, Tennessee, with a gunshot contusion of the skull. He died on June 18th, 1864, from cerebritis.

WELCH, CHARLES, Private, Co. D, 8th Maine Volunteers, aged 21 years, was wounded, at the battle of Cold Harbor, Virginia, June 5th, 1864, in the forehead, by a conoidal musket ball, which denuded the os frontis, though producing no apparent fracture. He was admitted to the hospital of the Eighteenth Corps, and thence conveyed to Washington, and admitted, on the 10th, into Harewood Hospital. The case seemed to be progressing favorably. The patient was sent, on June 16th, to New York City, but, having stopped at Philadelphia on his way, he died suddenly at a refreshment saloon, on June 21st, 1864.

Intracranial Extravasation.—The cases of Colonel Farnham, on p. 109, Private Rea, on p. 120, and that of Private Foster, recorded among the instances of trephining, afford illustrations of hæmorrhage within the cranium following gunshot contusions of the skull.

Intracranial Abscess.—The following are instances of suppuration following gunshot contusions of the cranium, and other illustrations will be found among the cases of trephining:

CRANE, ETHAN, A., Musician, Co. K, 44th New York Volunteers, was wounded, at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball, which struck the frontal bone on the right si e, near the median line, and glanced, apparently causing only a flesh wound; the bone was barely bruised. He was admitted to the hospital of the Fifth Corps, and, on June 10th, was sent to the Carver Hospital at Washington. The case progressed favorably until June 20th, when grave cephalic symptoms came on. The patient became comatose, and died on June 22d, 1864, from cerebral complications. The autopsy revealed a large abscess in the right anterior lobe of the brain, with meningitis beneath the seat of injury. The external table of the bone was slightly discolored and cribriform, while the internal presented a faint attempt at the formation of a circumscribed area of the effects of osteitis. The diploe was found of a dark yellowish gray color, as in cases of osteomyelitis in long bones. The pathological specimen was sent to the Army Medical Museum, and is numbered 1393 in Section I. The specimen and history were contributed by Assistant Surgeon H. Allen, U. S. Army.

SMITH, WILLIAM, Private, Co. G, 4th New York Heavy Artillery, aged 18 years, was wounded, at the battle of Hatcher's Run, Virginia, March 31st, 1865, by a conoidal ball, which caused a contusion of the left parietal bone. He was, on the following day, admitted to the hospital of the Second Corps. On April 5th, he was transferred to the Emory Hospital, Washington, D. C., and on April 9th, sent to the Cuyler Hospital, Philadelphia, Pennsylvania. On admittance no osseous lesion could be detected. The case progressed favorably until April 16th, when the patient had two or three slight convulsive paroxysms, lying in a somewhat soporose condition during the intervals. He afterwards became delirious, and finally almost completely comatose. The muscles of the left side of the body were observed to be in a state of spasmodic contraction, and a large collection of pus formed beneath the left side of the scalp, anterior to the wound, and was opened on April 29th. The pathological condition was supposed to be, that an abscess, resulting from the original shock to the brain substance, was exciting irritation, and would probably eventually burst into one of the lateral ventricles. Mercurials, tartarized antimony, and the fluid extract of veratrum viride were exhibited internally, while the head was kept somewhat elevated. Death ensued on the night of April 30th, 1865, one month from the reception of injury. An autopsy was made about fourteen hours after death, with the following results: there was no fracture of the skull to be detected when the scalp was removed, and the bone was not bared beneath the abscess, which has been described as having formed a few hours before death, but was manifestly necrosed just below the original wound. On removing the skull cap it was found that a plate of bone, about one inch long and three-quarters of an inch broad, had been separated by exfoliation from the inner table, and was adherent to the dura mater immediately beneath the position of the original scalp wound. The brain was removed with the membranes entire, but a moderate quantity of blood and serum being found beneath the dura mater and the skull. On reflecting the dura mater of the *right* hemisphere, the arachnoid over the middle lobe of the cerebrum was found to be acutely inflamed, presenting an abundant deposit of soft coagulable lymph. The membranes of the left side presented merely a slight pearliness, and the adhesion of the dura mater to the sequestrum, already referred to. The brain substance on the right side was healthy; on the left side, it was softened beneath the position of the wound, and, at the depth of about three-quarters of an inch, was a small abscess, not larger than a small hickory-nut. All other parts of the body examined appeared normal. The muscular contraction on the same side of the body as the wound was now accounted for by the existence of intracranial disease upon the opposite side. The case is reported by Henry S. Schell, Assistant Surgeon U. S. Army.

Epilepsy, mental imbecility, derangements of the special senses, and various paralyses were the not infrequent results of gunshot contusions of the cranium.

Paralysis.—Twenty-three cases are referred to in this class:

Adams, J. E., Corporal, Co. F, 15th Massachusetts Volunteers, received, at the battle of Ball's Bluff, Virginia, October 21st, 1861, a gunshot wound of the scalp, with contusion of the right parietal bone. A report of a medical examining board, dated February 20th, 1862, states that there is atrophy of the left arm, with partial paralysis of the sensory nerves and diminution of the temperature. He was discharged from the service, March 8th, 1862. His name is not upon the Pension Rolls.

Arend, John, Private, Co. F, 46th New York Volunteers, received, at the battle of South Mountain, Maryland, September 14th, 1862, a gunshot wound of the scalp, with contusion of the frontal bone. He was admitted to No. 1 Hospital at Frederick, on the 17th, and from there, on the 20th, was transferred to Stewart's Mansion Hospital at Baltimore. He was discharged from the service, March 17th, 1863, on which date Assistant Surgeon De Witt C. Peters, U. S. A., reports him as being greatly debilitated, and suffering from spinal irritation, with partial paralysis of the lower extremities, for which, treatment had afforded very little benefit. His name does not appear on the Pension List.

Booth, John, Private, Co. E, 55th Pennsylvania Volunteers, aged 29 years, received, at the battle of Drury's Bluff, Virginia, May 16th, 1864, a gunshot wound of the upper and posterior right parietal region, by a conoidal musket ball. He was taken prisoner, but subsequently exchanged, and admitted, on August 14th, into the First Divison Hospital at Annapolis, Maryland. The patient was afterwards sent to Camp Parole, and, on November 5th, transferred to the general hospital at Pittsburg. Paralysis of the left leg resulted, and he was discharged from service, May 20th, 1865, and pensioned. The case is reported by Assistant Surgeon H. R. Silliman, U. S. A. In August, 1867, Pension Examining Surgeon G. McCook reported that this pensioner was totally incapable of earning a living by manual labor, on account of partial hemiplegia, and that his disabilities were permanent.

Brown, Presley I., Corporal, Co. B, 102d Pennsylvania Volunteers, aged 24 years, received, at the battle of the Wilderness, Virginia, May 6th, 1864, a gunshot wound of scalp, a conoidal ball entering at middle of left parietal bone, passing backwards, making a flesh wound two inches in length, denuding the bone. He was admitted to Lincoln Hospital, Washington, D. C., on May 11th, and, on May 16th, was transferred to Patterson Park Hospital, Baltimore, Maryland; thence, on May 21st, to hospital at York, Pennsylvania. Acting Assistant Surgeon H. S. Smyser, under whose care the patient came at the latter hospital, reports that the patient stated that there was loss of sensation in right arm and hand from the moment he was struck by the ball. On June 10th, the arm was recovering, and, on June 13th, the patient was transferred to the hospital at Pittsburg, Pennsylvania, whence he was returned to duty on May 9th, 1865.

Bush, Aaron C., Lieutenant, 4th Wisconsin Cavalry, was, in February, 1864, shot in the head, the ball inflicting a scalp wound and contusion of the right parietal, and concussion of brain. He fell from his horse, and was conveyed to the regimental hospital very much depressed, but otherwise doing well. The regimental report for March, 1864, states that "Bush is in a fair way of recovery, although a long time will elapse before he will be able to return to duty." He was discharged on August 30th, 1864, and pensioned for partial hemiplegia of the left side.

Carson, J. M., Captain, Co. A, 25th South Carolina Regiment, aged 27 years, received, at the assault on Fort Fisher, North Carolina, January 15th, 1865, by a conoidal ball, a wound of the scalp, with contusion of the skull, causing a paralysis of the right arm. He was admitted, on the 22d, to Chesapeake Hospital, near Fort Monroe, and, on January 30th, was transferred to military prison, after which all trace of him is lost. The case was reported by Assistant Surgeon Ely McClellan, U. S. A.

Cooke, R. H., Private, Co. D, 12th Alabama Regiment, was examined, on July 24th, 1862, by Surgeon John G. Moore, 93d Alabama Regiment. He was suffering from an unhealed gunshot wound of the scalp, and probably the skull had been severely contused. He complained of numbness of the left leg. He was reported as unfit for duty.

Curry, John, Private, Co. A, 142d Pennsylvania Volunteers, was wounded, at the battle of Fredericksburg, Virginia, December 13th, 1862, by a buckshot, which injured the left parietal bone. He was treated in a field hospital; on December 23d, admitted to the Lincoln Hospital, Washington, D. C., and discharged from the service on February 21st, 1863. His right side and limbs were paralyzed. His name is not on the Pension Rolls.

Douglas, Alfred F., Private, Co. I, 6th Vermont Volunteers, aged 19 years, received, at the battle of the Wilderness, Virginia, May 6th, 1864, a wound of the right side of the scalp, by a conoidal musket ball, with contusion of the parietal. He was admitted into the Finley Hospital at Washington, May 11th. Partial paralysis of the lower extremities resulted. On August 11th, the patient was sent to the Smith Hospital at Brattleboro', Vermont, and, on September 11th, was transferred to the Baxter Hospital at Burlington. He was returned to duty, November 21st, 1864. The case is reported by Assistant Surgeon S. W. Thompson, U. S. V.

Garland, James W., Corporal, Co. G, 5th Wisconsin Volunteers, aged 23 years, was wounded at the battle of Cold Harbor, Virginia, June 1st, 1864, by a fragment of shell, which grazed the top of the head, on the median line, about five and a half inches from the margin of the hair on the forehead, inflicting a severe wound of the scalp, about two inches in length by one inch in width, and contusing the cranium. He was unconscious for about ten minutes, the control of the lower extremities was lost, and sensation was impaired. Spasms and temporary partial paralysis of the upper extremities supervened. On June 6th, he was admitted to First Division Hospital at Alexandria, Virginia. On June 28th, he was transferred to McClellan Hospital, Philadelphia, and thence, on July 6th, to Turner's Lane Hospital. At the latter date, the patient suffered from severe headache, and the power of motion of the left leg was still impaired, though his general health was good. On July 20th, a

small piece of bone exfoliated, and was removed. Patient was gradually regaining the use of left leg. On November 15th, the wound was reported as being healed. During the treatment, he had three paroxysms of intermittent fever. The patient was transferred to the Veteran Reserve Corps on March 17th, 1865. The case is reported by Surgeon Robert A. Christian, U. S. V. He was discharged from service, September 26th, 1865. In 1866, Pension Examining Surgeon J. H. Gallagher reported that he had slight paralysis of the left leg, and headache and faintness on exposure to the sun. Any excitement or study aggravated these symptoms. The examiner regarded these symptoms as likely to increase in severity.

Hensley, H. S., Sergeant, Co. C, 16th North Carolina Regiment, aged 24 years, was wounded, on May 22d, 1864, by a conoidal ball, which inflicted a severe wound of the scalp, and probably, a contusion of the skull. Paralysis of the lower extremities ensued. He was admitted to the field hospital of the 1st division, Fifth Corps, and, on May 29th, was transferred to Mount Pleasant Hospital, Washington; thence, on July 14th, to Lincoln Hospital, whence he was transferred to Old Capitol Prison on August 30th, 1864, and finally exchanged.

Ingersoll, Frank D., Private, Co. E, 26th New York Volunteers, was, on September 24th, 1862, admitted to the Carver Hospital, Washington, D. C., with a shell wound of the head, lacerating the scalp and contusing the outer table of the skull. He was discharged on January 12th 1863, on account of debility and deranged innervation. His name does not appear on the Pension List.

Keser, Wallace, Private, Co. F, 126th New York Volunteers, aged 25 years, received, in the engagement at Harper's Ferry, Virginia, September 13th, 1862, a gunshot wound in the head, at the junction of the occipital with the parietal bones. He was, on December 29th, admitted to Camp Parole, Maryland. He was subject to vertigo, and suffered from partial paralysis of the right lower limb. He was discharged from service on January 7th, 1863. He is not reported as being an applicant for a pension.

McFoley, James, Private, Co. A., 11th Pennsylvania Reserve, aged 35 years, was wounded at the battle of Spottsylvania, Virginia, May 10th, 1864, by a conoidal ball, which passed through the scalp, grazing the left parietal bone near the sagittal suture. He was conveyed to the Mount Pleasant Hospital, Washington, and, on May 19th, was sent to the Camden Street Hospital at Baltimore. Hemiplegia of the right side had supervened. He was transferred to Annapolis, June 22d, and, on August 10th, to Pittsburg, where he was discharged from the service, December 24th, 1864. Paralysis of the right arm still existed. He has not applied for a pension.

McKendrick, John P., Co. I, 12th New Hampshire Volunteers, received, at the battle of Chancellorsville, Virginia, May 3d, 1863, a gunshot contusion of the skull, posterior aspect. He was admitted to the field hospital of the 3d division, Third Corps, on the following day, and from there sent to Alexandria, where he was admitted, on June 14th, to Mansion House Hospital, whence he was transferred, on the 16th, to hospital at Concord, New Hampshire. Paralysis of both lower extremities ensued, and the patient suffered from constant uneasiness and pain in the head. He was examined by Surgeon J. W. Buchanan, U. S. V., and discharged from the service on the 12th of August, 1863. His name does not appear on the Pension List.

Miles, Levi, Private, Co. C, 52d Indiana Volunteers, aged 50 years, was wounded at Fort De Russy, Louisiana, March 14th, 1864, by a conoidal ball, which entered through the lobule of the left ear, and emerged at the nape of the neck, below the occipital bone, contusing in its course, but not fracturing, the temporal bone. He was sent, on March 16th, to the hospital steamer Woodford, and, on April 30th, was transferred to the hospital steamer R. C. Wood. On May 8th, he was sent to New Orleans, and thence to the Overton Hospital at Memphis, Tennessee. He was returned to duty on September 5th, 1864. On February 13th, 1865, he was admitted to the Washington Hospital at Memphis, suffering from frequent attacks of trembling, and other symptoms of paralysis. The wound had not yet healed. He was discharged from service on April 20th, 1865.

Pope, Theodore, Private, Co. C, 9th Ohio Volunteers, received, at the battle of Chickamauga, Georgia, September 19th, 1863, a gunshot contused wound of scalp. He was admitted into Hospital No 1, Nashville, Tennessee, on September 25th, and, on September 27th, was sent to Louisville, and admitted into Hospital No. 4, where his wound was found to be complicated by contusion of the left parietal bone. On December 30th, 1863, he entered Washington Park Hospital, Cincinnati, and, on January 8th, 1864, was sent to Camp Dennison, where he was discharged from service by reason of partial hemiplegia of the right side of the body. His name does not appear on the list of pensioners. The case is reported by Surgeon William Varian, U. S. V.

Remick, Martin, Private, Co. I, 79th Illinois Volunteers, aged 19 years, was wounded, at the battle of Murfreesboro', Tennessee, December 31st, 1862, by a round musket ball, which struck about the junction of the occipital and parietal bones, and passed laterally through the integument, making a furrow nearly three inches in length, and touching and bruising, without fracturing, the bone. He was, on January 25th, 1863, admitted to Hospital No. 5, Murfreesboro'; on February 16th, he was sent to Hospital No. 8, Nashville; on March 1st, to Hospital No. 13, Louisville, Kentucky; and, on March 8th, to the hospital at Quincy, Illinois. He suffered occasionally from tremors, more or less paroxysmal, but in February, 1864, the wound had healed. He still complained of pain in the head, and was subject to many nervous symptoms. He was discharged from the service on May 18th, 1865. He is not an applicant for a pension.

Snyder, Joseph, Colonel, 7th West Virginia Volunteers, received, at the battle of Fredericksburg, Virginia, December 13th, 1862, a severe gunshot contusion of the skull. The bone was denuded of periosteum, and slight paralysis of the left arm supervened. The patient was treated in private quarters, was furloughed on December 18th, 1862, and finally discharged from the service on September 7th, 1863. His name does not appear on the Pension List.

Stanley, J. D., Private, Caskie's Virginia Battery, was admitted into Confederate Hospital No. 1, Richmond, Virginia, with a gunshot wound of the scalp, with contusion of the cranium, received on September 24th, 1863. Hemiplegia resulted from the injury, and the patient was furloughed for sixty days on November 24th, 1863.

STERLING, WILLIAM, Private, Co. B, 44th Illinois Volunteers, aged 32 years, was wounded, at the battle of Kenesaw Mountain, Georgia, June 27th, 1864, by a fragment of shell, which struck the right supraorbital ridge, injuring the frontal bone and destroying the right eye. He had previously received, at the battle of Chickamauga, Tennessee, September 19th, 1863, a flesh wound of the right arm. He was, on November 29th, 1864, admitted to the hospital steamer R. C. Wood, and, on December 1st, transferred to the hospital at Mound City, Illinois. Chronic neuralgia of the right supraorbital nerve followed. The patient was discharged from the service on February 16th, 1865. The strength and usefulness of the right arm were impaired. His name does not appear on the Pension Rolls.

SHERIDAN, THOMAS, Private, Co. B, 3d United States Cavalry, aged 27 years, was wounded, near Little Rock, Arkansas, October 16th, 1864, in the head by a conoidal ball, which lodged beneath the scalp, near the right ear. He was admitted, on October 23d, to the hospital at Little Rock. Convulsions supervened, and death occurred on December 23d, 1864.

THOMPSON, KUND, Private, Co. I, 82d Illinois Volunteers, aged 30 years, received, at the battle of Chancellorsville, Virginia, May 3d, 1863, a wound by a pistol ball, which struck the head and denuded the left parietal of periosteum. He was admitted to the field hospital of the 3d division of the Eleventh Corps on May 4th, 1863, and transferred to Douglas Hospital at Washington on July 21st. During the progress of the case, paraplegia ensued. The patient also suffered from a general and constant pain in the head. He was transferred to Christian Street Hospital at Philadelphia on September 15th, 1863. Assistant Surgeon W. W. Keen, U. S. Army, reports that, on the date of his discharge, although suffering from an evident disease of the brain, he had so far improved as to be able to walk. Discharged February 17th, 1864. His name does not appear on the Pension Rolls.

WAGONER, JEREMIAH, Private, Co. G, 85th Illinois Volunteers, aged 25 years, was wounded, in an engagement at Peach Tree Creek, Georgia, July 19th, 1864, by a musket ball, which entered at the upper part of the frontal region, and, passing directly backward over the vertex, grazing the bone in its passage, made its exit at a distance of three inches from the point of entrance. He was received, on July 23d, into No. 2 Hospital at Chattanooga, Tennessee, and from there successively transferred to Nashville, Jeffersonville, St. Louis, and Mound City, Illinois. He was admitted to the hospital at the latter place on September 4th, 1864, at which time the wound was discharging freely, but gradually healing. There was also paralysis of the right arm, which the patient stated had began on receipt of injury, and gradually increased until the limb had become useless. He was transferred on September 23d, and, on the following day, admitted to hospital at Quincy, Illinois, where he remained until returned to duty, April 12th, 1865.

Loss or Impairment of Vision.—Many forms of impairment of vision resulted from gunshot scalp wounds, with contusion of bone and lesions of the nerves, or secondary disorders of the brain. Conjunctivitis, ptosis, amblyopia, and amaurosis were the consecutive eye diseases most commonly observed. The following cases and those of McLarney (p. 100), and Patterson (p. 104), belong to this class:

ART, JAMES, Private, Co. E, 2d Pennsylvania Volunteers, aged 19 years, was wounded, in an engagement before Petersburg, Virginia, June 18th, 1864, by a conoidal musket ball, which struck the frontal region one and one-half inches above the left eye, contusing the bone. He was admitted into the field hospital on the 19th, and, a few days, later sent to the Chesapeake Hospital at Fort Monroe. On July 4th, the patient was transferred to Philadelphia, and admitted into the McClellan Hospital. On August 8th, he was sent to Turner's Lane Hospital. There was ptosis of the eyelids of both eyes, and loss of vision for some days. On May 10th, he was again received into the McClellan Hospital, and on July 13th, 1865, was mustered out of service. The case is reported by Surgeon Lewis Taylor, U. S. A. The name of this patient does not appear on the Pension List.

BUZZELL, HIRAM H., Private, Co. G, 40th Massachusetts Volunteers, aged 38 years, received, in an engagement before Petersburg, Virginia, in June, 1864, a contusion of the skull, by a fragment of shell. He was admitted into the hospital of the Eighteenth Army Corps on July 1st. On July 2d, he was transferred to the general hospital at Fort Monroe, Virginia. Conjunctivitis supervened. He was returned to duty, July 29th, 1864.

COLE, JACOB, Private, Co. I, 64th Illinois Volunteers, aged 24 years, received, at the battle of Nashville, Tennessee, December 13th, 1864, a gunshot wound of the scalp, with contusion of the bone. He was admitted, on the following day, to hospital No. 1, Nashville, and, on May 3d, 1865, transferred to hospital No. 2, of the same city. For a time he suffered from chronic conjunctivitis, but he recovered and was returned to duty on July 16th, 1865.

EMERICK, JACOB, Private, Co. A, 148th Pennsylvania Volunteers, aged 23 years, received, at the battle of Chancellorsville, Virginia, May 3d, 1863, a contusion of the right parietal bone, by a fragment of shell. He was admitted into the field hospital of the 1st division of the Second Corps on the following day, and, about June 13th, was sent to the hospital at Point Lookout, Maryland On September 29th, he was transferred to the Mower Hospital at Philadelphia. Vision was much impaired. On December 22d, 1863, he was returned to duty.

GRAHAM, MICHAEL, Corporal, Co. H, 103d Ohio Volunteers, aged 23 years, received, during the siege of Knoxville, Tennessee, November 18th, 1863, a gunshot contusion of the right parietal. He was admitted on the same day to hospital No. 3, Knoxville; on March 8th, 1864, he was sent to the hospital at Cleveland, Ohio, and, on April 7th, 1864, transferred to the Veteran Reserve Corps. On July 6th, he was admitted to the Satterlee Hospital, Philadelphia, suffering from granular conjunctivitis. He was discharged from the service on July 6th, 1865, on account of impaired vision, the result of gunshot wound of the head. His name is not upon the Pension Roll.

Hays, E. B., Private, Co. H, 21st Mississippi Regiment, was admitted into Jackson Hospital, Richmond, Virginia, with a gunshot wound of left temporal region, received March 25th, 1865. Vision was impaired.

HAGAN, THOMAS, Captain, Co. G, 71st Pennsylvania Volunteers, received, at the battle of Antietam, September 17th, 1863, a gunshot wound over left parietal bone, causing amaurosis of both eyes. He was unable to do duty until November 16th, when he joined his regiment, but was compelled to apply for sick leave again on December 19th, 1862. He resigned on February 7th, 1863. The loss of vision was almost complete in the left eye, and the right eye was only impaired. In April, 1865, Pension Examiner T. F. Smith, of New York, reports that the left iris was very much dilated; that he could not read other than the very largest type.

JAMES, W. J., Sergeant, Co. F, 83d Ohio Volunteers, was wounded at the battle of Arkansas Post, Arkansas, January 11th, 1863, by a conoidal musket ball, which struck against the left frontal eminence, and glanced backwards as far as the central portion of the left parietal, denuding the bone to the extent of three inches. The vision became impaired, and was, for a short time, nearly lost. He was taken to the hospital steamer D. A. January, on January 13th, and conveyed to Memphis, Tennessee, where he was admitted, on the 23d of the month, into Hospital No. 3. In the course of two or three days, he was seized with convulsions, which recurred at intervals of three or four weeks. The vision of the right eye was more affected than that of the left, and seemed to vary with the condition of the wound. He was discharged from service on the 4th of April. The wound had healed to some extent, and looked healthy. Thus far, no exfoliation of bone had taken place. The patient walked with a feeling of giddiness and insecurity, the cerebral symptoms not being in any degree alleviated, though his general health was good. In July, 1868, James was a pensioner at six dollars per month, his disability being rated at three-fourths.

LANIGAN, JAMES, Private, Co. E, 25th Massachusetts Volunteers, received, in an engagement before Petersburg, Virginia, June 23d, 1864, a gunshot contusion of the skull. He was admitted to hospital at Hampton, Virginia, on June 25th, and, on July 4th, sent to Filbert Street Hospital, Philadelphia. On July 24th, he was transferred to Summit House Hospital; thence, on August 24th, to Satterlee Hospital, where, on May 20th, 1865, he was discharged from service, by reason of impaired vision. His name does not appear on the Pension List. The case is reported by Surgeon John E. MacDonald, U. S. V.

MOORE, J. C., Sergeant, Co. H, 99th Pennsylvania Volunteers, aged 37 years, received, at the battle of the Wilderness, Virginia, May 5th, 1864, a wound of the frontal region by a conoidal musket ball, which scraped the bone. He was admitted into the field hospital of the 3d division, Second Army Corps, and, a few days later, sent to Washington, and admitted, on May 11th, into the Finley Hospital. Simple dressings. The patient was transferred to Philadelphia on May 18th, and was admitted into the South Street Hospital. On May 16th, 1865, he was sent to the Summit House Hospital, and, on July 5th, 1865, he was discharged from the service. The case is reported by Surgeon S. J. Y. Mintzer, U. S. V. He was pensioned July 6th, 1865, and, in May, 1867, Pension Examiner T. B. Read reported that his eyesight was much impaired, and that he suffered from giddiness and headache, and he thought the pensioner's disabilities permanent, though some amelioration might be anticipated.

NEIL, WM. H., Captain, Co. D., 26th New York Volunteers, was wounded at Fredericksburg, Virginia, December 13th, 1862, by a conical ball, which passed across his forehead about an inch above his eyebrows, making a very slight wound, hardly sufficient to draw blood, but probably contusing the os frontis. He was instantly rendered totally blind; at the same time, the motor nerves near the eye were paralyzed, so that the lids drooped, notwithstanding every effort he made to raise them. The eye-balls were entirely devoid of expression. He was admitted to regimental hospital, and thence sent to general hospital. Surgeon W. B. Coventry, who reports the case, states that he incidentally learned afterwards that the patient commenced to recover the sight of one eye. This officer's name does not appear on the rolls of the Pension Bureau.

Newson, John G., Sergeant, Co. B, 30th North Carolina Regiment, aged 18 years, was wounded, in an engagement at Kelly's Ford, Virginia, November 7th, 1863, by a conoidal musket ball, on the back and upper part of the scalp, contusing the skull. He became unconscious, and remained so until the next day. On November 9th, he was admitted to the Douglas Hospital, Washington, D. C. He was weak and giddy, his eyes were red and injected, and very sensitive to light. He had no appetite, felt stupid, and had constant inclination to vomiting. These symptoms continued for some days, but, on November 23d, he was free from pain and able to walk about. His appetite had improved, and the discharge from the wound looked healthy. He was transferred to the Lincoln Hospital, and, on December 7th, 1863, sent to the Old Capitol Prison. The case is reported by Acting Assistant Surgeon Carlos Carvallo.

PLOTT, LEWIS, Sergeant, Co. A, 71st Ohio Volunteers, aged 25 years, was wounded in an engagement in front of Nashville, Tennessee, December 15th, 1864, by a conoidal musket ball, which contused the frontal bone, and destroyed the vision of the right eye. He was admitted, on the 17th, into Hospital No. 1, Nashville, and, on the 22d, transferred to Hospital No. 15, of the same city. On the 4th of January, 1865, he was sent to the Brown Hospital at Louisville, Kentucky, and, in March, transferred to Camp Dennison, Ohio. Simple dressings constituted the main treatment. He recovered, and was discharged from service on the 13th of June, 1865. The Commissioner of Pensions reports, December 11th, 1869, that Plott is a pensioner at four dollars per month. The sight of the right eye is destroyed, and the hearing impaired as well.

SOUDER, ANDREW, Private, Co. C, 3d Michigan Volunteers, aged 30 years, in the action at Groveton, Virginia, August 27th, 1862, received a gunshot contusion of the left temporal region. He was admitted into the Georgetown College Hospital, D. C., on December 13th, and, on January 2d, was transferred to Philadelphia, and admitted into the Mower Hospital. Loss of vision of the left eye resulted. He was discharged from service, February 21st, 1863, and pensioned. The wound caused arthritis of the temporo-maxillary articulation, ending in partial anchylosis, so that, according to the report of Pension Examining Surgeon Wilson Jewell, the patient was unable to open his mouth more than half an inch.

Deafness—The cases of KING (p. 101), and of CHAMBERLAIN (p. 119), and those detailed in the fourteen following abstracts are examples of deafness following gunshot contusions of the skull:

ARTUS, CHARLES, Private, Co. I, 15th New York Artillery, aged 30 years. Contusion of the left temporal by a piece of shell. Weldon Railroad, August 20th, 1864. Treated at field hospital of Fifth Corps, and Mount Pleasant, Washington.

Discharged from service, June 20th, 1865, on account of deafness of the left ear and facial neuralgia, by Assistant Surgeon H. Allen, U. S. A. His name does not appear on the Pension List.

Benson, Stephen D., Sergeant, Co. A, 31st Maine Volunteers, aged 20 years, was wounded at the battle of Spottsylvania Court House, Virginia, May 12th, 1864, by a conoidal ball, which entered the left side of the head, one inch behind the meatus auditorius externus, on a line with its opening, and emerged close to the acromion process of the right scapula. He was entirely unconscious for several hours, but had some realization of pain in the evening, when he made an ineffectual effort to get on his feet. He was admitted to the hospital of the 2d division of the Ninth Corps, and, on May 24th, was sent to the Harewood Hospital, Washington. For about three weeks there was much mental aberration, especially at night. Assistant Surgeon Sumner A. Patten, who reports the case, examined the patient on June 20th, 1864. The wounds of entrance and of exit discharged freely. There was numbness of the left side of the head, and deafness of the left ear. The scalp in the vicinity of the wound was much swollen. On rising to his feet, he was so dizzy that he was compelled to lay hold of something to avoid falling. Occasionally small pieces of necrosed bone were discharged from the left ear. Sergeant Benson, commissioned as lieutenant, on August 1st, returned to his regiment, but, on December 5th, 1864, resigned. On April 2d, 1866, Doctor Patten wrote that this officer had not been able to labor since the reception of the injury; that there was a constant feeling of weakness, although his appetite was generally good. Confusion of thought and impairment of memory were also well-marked effects of the injury. His general health was deteriorated, and he weighed but 144 pounds, having weighed 163 when he enlisted. In September, 1868, Examining Surgeon E. F. Sanger reported that this pensioner, residing in Bangor, Maine, had total deafness of the left ear, and that his general health was very poor, and his disabilities total. In a previous communication, Pension Examiner J. C. Weston reported that frequent abscesses formed about the mastoid process, due probably to caries.

Bevelheimer, George W., Private, Co. A, 19th Indiana Volunteers, was wounded at the second battle of Bull Run, Virginia, August 30th, 1862. The missile entered over the inferior curved line of the occipital bone, two inches to the left of the median line; it then passed forward, immediately below the auditory foramen, and produced a large lacerated exit wound in front of the ear. He was admitted on September 6th to Judiciary Square Hospital, at Washington, D. C. At the end of the third week, although his wounds had nearly closed, there was an entire loss of hearing on that side, the recovery of which the probabilities were very unfavorable. He was discharged from the service, December 16th, 1862. His name does not appear on the Pension List. This case is reported in the Boston Medical and Surgical Journal, volume 67, page 493.

Dungan, T. J., Private, Co. F, 46th Pennsylvania Volunteers, received, in an engagement at Cedar Mountain, Virginia, August 9th, 1862, a gunshot wound of the right temple. The bone near the auditory foramen was contused, and the facial nerve was implicated. He was admitted, on August 13th, to the 2d division hospital, at Alexandria, and, on August 31st, transferred to the Judiciary Square Hospital, Washington, whence he was discharged from the service on November 12th, 1862. The sense of hearing was impaired, and the right side of the face paralyzed. In March, 1863, Pension Examiner G. McCook, of Pittsburg, Pennsylvania, reported this man's disabilities permanent and incurable. In November, 1867, Pension Examiner E. Swift reported that the sense of hearing on the right side was almost entirely lost, and that facial paralysis existed, together with an inability to close the right eyelids.

Goodrich, James D., Private, Co. F, 124th Ohio Volunteers, aged 21 years, received, at the battle of Buzzard Roost, Georgia, May 9th, 1864, a contusion of the left parietal by a conoidal musket ball. He was treated in a field hospital until May 16th, when he was transferred to Nashville, Tennessee, and remained in Hospital No. 19, until May 19th, when he was sent to Clay Hospital, Louisville, Kentucky, and thence, on June 29th, to Camp Dennison, Ohio, from whence he was discharged from the service, August 27th, 1864, by reason of deafness and impaired mind. His name does not appear on the Pension List. Surgeon A. P. Varian, U. S. V., reports the case.

Gregory, Adam, Corporal, Co. H, 18th Ohio Volunteers. Shell contusion of the skull. Chickamauga, September 19th, 1863. Treated at Cumberland Hospital, Nashville. Slight deafness resulted. Returned to duty September 28th, 1863. He does not appear to be a pensioner.

Havens, Charles P., Private, Co. F., 144th New York Volunteers, aged 28 years. Contusion of the left temporal region by a conoidal musket ball. Honey Hill, South Carolina, November 30th, 1864. Treated at regimental, Hilton Head, McDougall, and Elmira Hospitals, and discharged from service May 25th, 1865, and pensioned. In September, 1868, Examining Surgeon John S. Pfouts reports that this man had complete deafness of the left ear.

Kroesen, Cyrus, Private, Co. A, 77th Illinois Volunteers, was wounded at the battle of Arkansas Post, January 11th, 1863, by a round ball, which struck the left side of the head, contusing the frontal bone, passed backwards above the base of the ear, making a track three inches in length beneath the scalp. He was conveyed to Memphis, Tennessee, by the hospital steamer D. A. January, and admitted, on January 22d, to the Adams Hospital. Audition of the left ear was entirely destroyed; that of the right ear is perfect. The wound healed without any untoward symptom. He was returned to duty July 2d, 1863. His name does not appear on the Pension Rolls.

Peppers, Martin, Private, Co. D, 3d Iowa Volunteers, was, on November 4th, 1862, admitted to the hospital at Keokuk, Iowa, suffering partial deafness and disease of the frontal sinus, right side, caused by an explosion of a shell in the engagement at Big Hatchie, Tennessee, October 5th, 1862 The injury was followed by abscess of the frontal sinus. The patient was discharged from the service on March 30th, 1863. His name does not appear on the Pension List.

Pulliam, Elijah C., Private, Co. H, 32d Illinois Volunteers, received, at the battle of Shiloh, Tennessee, April 6th, 1862, a wound of the scalp in the occipital region, with contusion of bone, by a buckshot. His hospital history previous to August 6th, the date on which he was admitted to House of Refuge Hospital at St. Louis, Missouri, is wanting. Erysipelas supervened. The patient suffered several relapses of the disease, which finally terminated in abscesses behind both ears, causing temporary deafness on the left side. He was discharged from the service on October 15th, 1862. His name is not recorded on the Pension Rolls.

Rawdon, James, Corporal, Co. K, 34th Massachusetts Volunteers, aged 18 years, was wounded, at the battle of New Market, Virginia, May 15th, 1864, by a fragment of shell, which lacerated the scalp over the posterior border of the left parietal bone to the extent of two inches, and contused the bone. He was conveyed to the hospital at Cumberland, Maryland. The wound healed favorably, but the patient suffered for two months with pain and partial deafness. On October 25th, the headache ceased and the hearing was restored, and, on October 26th, 1864, the man was returned to duty. His name does not appear upon the list of pensioners.

Risa, A. H., Private, Co. I, 11th North Carolina Infantry, received, July 1st, 1863, a gunshot scalp wound of the temporal region, with contusion of the bone. He was admitted into the Moore Hospital No. 24, Richmond, October 28th. Audition impaired. On November 4th, 1863, he was furloughed for sixty days.

Thurston, William F., Surgeon 1st Rhode Island Artillery, was wounded, at the battle of Fair Oaks, June 28th, 1862, by a ball from a spherical case shot, which struck his left parietal bone, contusing but not fracturing it. Notwithstanding his injury, he continued to attend the wounded of his regiment till a few days after the battle, when he had a leave of absence for twenty days. Deafness came on gradually, and Surgeon Thurston finally became incapable of performing duty in the field. On April 6th, 1863, he was mustered out of service, and pensioned. In April, 1869, Pension Examining Surgeon C. Hoppin reported that he was completely deaf, and a great sufferer from vertigo.

Winsor, W. H., Captain, Co. F, 18th Massachusetts Volunteers, received, at the battle of Fredericksburg, Virginia, December 13th, 1862, a gunshot wound of the head. He was admitted, on the same day, to the field hospital of the 1st division of the Fifth Corps. On December 17th, 1862, he reported to Surgeon Thomas Antisell, at Washington, D. C., who reported the injury as a scalp wound, with contusion of the left temple, with loss of hearing on that side. He was furloughed on December 19th for twenty days. Resigned March 15th, 1863. His name is not found on the Pension Rolls.

Aphasia.—This obscure and curious affection was observed in three cases, as a sequence of gunshot contusions of the skull. One instance is cited on p. 105:

Chapman, H. V., Private, Co. A, 5th Virginia Cavalry, aged 29 years, received a wound, by a pistol ball, on October 11th, 1863, above the left superciliary ridge. The wound was contused, and the ball passed out from under the ligaments about the left jaw, after causing a concussion of the brain, resulting in aphasia. He was admitted to the Chimborazo Hospital, Richmond, October 23d, 1863, and was furloughed on the 17th of the following month, his speech being partially regained, though he could not formulate sentences in his mind.

Helmes, J. C., Private, Co. F, 48th North Carolina Infantry, received a gunshot wound of the scalp, contusing the skull. He was admitted into the No. 8 Hospital, Richmond, on September 28th, 1862. Aphasia resulted. On November 1st he was furloughed.

Epilepsy.—Nine cases are reported to have resulted in epilepsy, as a remote effect of gunshot contusions of the cranium:

Anderson, Alexander, Private, Co. I, 24th Massachusetts Volunteers, was discharged from the service on October 19th, 1862, at Camp Convalescent, Fort McHenry, Maryland. He had been wounded in the head in March, 1862, near Newberne, North Carolina, by a fragment of shell, which lacerated the scalp and contused the left parietal. Twice afterwards, he was attacked by epileptiform convulsions. He was pensioned and, December 27th, 1862, Pension Examining Surgeon G. S. Jones reported that he suffered from convulsion, that his memory was impaired, and that he was unable to labor.

Davis, William E., Private, Co. C, 28th Kentucky Volunteers, aged 21 years, was wounded in the engagement before Marietta, Georgia, June 27th, 1864. The missile entered just above the left, and escaped above the right superciliary ridge, contusing the frontal. He was admitted to the field hospital of the Fourth Corps, and, on the next day, sent to the general field hospital at Big Shanty; on July 18th, to hospital No. 2, Chattanooga, Tennessee; on July 20th, to the Cumberland Hospital, Nashville; on August 3d, to the Foundry Hospital Kentucky; and, on October 12th, to the Brown Hospital, Louisville, Kentucky, whence he was returned to duty on March 8th, 1865. In the various hospitals, he is reported as suffering from epilepsy. His name does not appear on the Pension Rolls.

Harmon, Gilbert J., Sergeant, Co. F., 1st New York Cavalry, aged 18 years, was admitted into the hospital at Parkersburg, Virginia, September 26th, 1864, with a gunshot contusion of the skull. He was pale, emaciated, and weak, and subject to epileptic convulsions. He had not done duty for sixteen months, and being unfit for the Veteran Reserve Corps, he was discharged from the service on November 18th, 1864. His name is not on the Pension List.

Miller, Noah, Private, Co. H, 91st, Pennsylvania Volunteers, aged 33 years, received, in the battle of Fredericksburg, Virginia, December 13th, 1862, a gunshot wound of the scalp, with denudation of the cranium. He was conveyed to Washington, and admitted, on the 17th, into the Mt. Pleasant Hospital. On January 5th, 1863, the patient was transferred to the Mower Hospital, Philadelphia. On May 2d, he was seized with an epileptic convulsion, which continued two hours, He also suffered from rheumatism. Discharged from service, September 21st, 1863. Surgeon Joseph Hopkinson, U. S. V., reports the case. The name of the patient is not upon the records of the Pension Office.

Preiss, Charles, Sergeant, Co. A, 40th New York Volunteers, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal ball, which caused a gunshot scalp wound over the occipital, with contusion of the outer table. He was taken to the hospital of the 1st division, Third Corps, and, on September 5th, 1863, was admitted to the Ladies' Home Hospital, New York. He was discharged from the service on December 12th, 1863, suffering from epilepsy. His name is not on the records of the Pension Office.

Stroud, H. M., Private, Co. F, 4th South Carolina Infantry, aged 23 years, received, on May 20th, 1864, a gunshot wound of the left side of the head. He was admitted into the Jackson Hospital, Richmond, Virginia, on the 24th. Frequent attacks of epilepsy followed, and he was retired upon a surgeon's certificate of disability, March 25th, 1865.

SULLIVAN, TIMOTHY, Private, Co. D, 2d Massachusetts Cavalry, was admitted to the field hospital at Sandy Hook, Maryland, after the battle of Cedar Creek, Virginia, October 19th, 1865, where he was treated for epilepsy. From here, he was transferred, successively, to Jarvis Hospital at Baltimore; Cuyler Hospital at Germantown, Pennsylvania; Turners' Lane Hospital at Philadelphia; and finally, on May 10th, 1865, to McClellan Hospital. Here the cause of the disease was attributed to a gunshot wound of the scalp, with contusion of the skull, but as his name does not appear on the list of casualties, and as his wound is not mentioned in the reports of the hospitals in which he had been previously treated, it is not certain that his disease can be traced to this cause. He was discharged from service, June 25th, 1865, and pensioned. Pension Examiner G. S. Jones reports, in July, 1865, that this pensioner had depressed cicatrices on the top of the head, and suffered greatly from epilepsy, and that his disabilities were probably permanent.

WALLACE, WILLIAM, Private, Co. A, 23d Ohio Volunteers, received, at the battle of Antietam, Maryland, September 17th, 1862, a gunshot scalp wound, implicating the pericranium. He was admitted, on September 21st, into the Capitol Hospital, Washington, and, on the 25th of the same month, transferred to the Ward Hospital, Newark, New Jersey. He is reported as returned to duty on March 26th, 1863; but, on July 25th, he was admitted into the general hospital at Gallipolis, Ohio. Epileptiform convulsions supervened upon long-continued exertion. He was transferred to the Veteran Reserve Corps, October 30th, 1863. The case is reported by Acting Assistant Surgeon James R. Beel. The name of this patient is not upon the Pension Rolls.

Walters, George W., Private, Co. C, 51st Virginia Infantry, aged 24 years, received, at the affair at Fayetteville, Virginia, September 10th, 1862, a wound at the anterior and superior portion of the right temporal region by a fragment of shell. Epilepsy resulted, and he was discharged from the service upon a certificate of disability, February 14th, 1865. The case is reported by Surgeon James Thomas Cropp, 51st Virginia Infantry.

Mental Aberration.—In the following cases, gunshot contusions of the cranial bones produced such lesions of the brain as led to insanity:

CHAMBERLAIN, CORNELIUS W., Corporal, Co. B, 10th New Hampshire Volunteers, aged 28 years, in an action near Fort Harrison, Virginia, September 30th, 1864, received contused wounds of the head, trunk, and upper extremities, by fragments of shell. He was admitted into the general hospital of the Eighteenth Corps, at Point of Rocks, Virginia, on October 9th, and, on October 26th, sent to the hospital at Fort Monroe. On November 4th, he was furloughed, and, on the 18th, examined for discharge, at Concord, New Hampshire. Partial paralysis of the right side resulted. There was a purulent discharge from the right ear, and audition was impaired. There was, likewise, constant aberration of the mind. He was discharged from service, January 16th, 1865, with a degree of disability rated total. He receives a pension of eight dollars per month.

COLVIN, PERRY, Private, Co. C, 47th Pennsylvania Volunteers, aged 30 years, received, at the battle of Cedar Creek, Virginia, October 19th, 1864, a contusion of the left parietal by a fragment of shell, about an inch from the median line. He was admitted into the Mower Hospital, Philadelphia, from the field, on October 23d. About two weeks after the reception of the injury, a hæmorrhage of blood, which afterwards became purulent, took place from the right, and, subsequently, from the left ear. Two months later, a piece of bone, about five-eighths of an inch in diameter, came away from the external table. Simple dressings were used. On January 24th, the patient was transferred to the Satterlee Hospital. The wound was healed, but deafness remained. He was discharged on June 14th, 1865, by reason of impairment of the mental faculties. He was pensioned on this account. He is quite incapacitated from transacting business, according to the account of Pension Examiner Wm. H. Cornell.

CRAWFORD, QUIMBY H., Private, Co. D, 4th Michigan Volunteers, aged 21 years, was wounded, at the battle of Gettysburg, Pennsylvania, July 3d, 1863, in the scalp, by a conoidal musket ball, which entered the right temple and emerged behind the ear. His mental powers were deranged for two days after the reception of the injury. He was, on July 5th, 1863, admitted to the Satterlee Hospital, Philadelphia, Pennsylvania, and returned to duty on January 22d, 1864.

ERWIN, HENRY, Private, Co. D, 7th Connecticut Volunteers, was wounded, in the action at Pocotaligo, South Carolina, October 22d, 1862, and was admitted, on the following day, to the hospital at Hilton Head, with a gunshot lacerated wound over the left parietal bone. He was afterwards sent to Fort Wood, New York Harbor, and, on February 6th, 1863, discharged from the service on account of gunshot wound, involving a contusion of the skull. He was pensioned from this date. Long subsequently, Pension Examiner E. R. Bardin, of Fairfield county, Connecticut, reported that the pensioner's mind was greatly deranged, that he was totally and permanently incapacitated for labor, and required constant supervision.

FULLARD, ANDREW, Private, Co. D, 78th New York Volunteers, aged 31 years, received, at the battle of Gettysburg, Pennsylvania, July 3d, 1863, a gunshot contusion of the frontal bone, from a fragment of shell. He was admitted to a field hospital, and, on July 11th, was sent to the Satterlee Hospital, Philadelphia. He suffered from violent headache and vertigo, and was much debilitated in body and mind. He was discharged from the service on November 27th, 1863. His name does not appear on the Pension Rolls.

PALMER, FRANKLIN L., Private, Co. C, 146th New York Volunteers, aged 36 years, received, at the battle of the Wilderness, Virginia, May 5th, 1864, a wound of the right side of the scalp, involving the periosteum, by a conoidal musket ball. He was admitted into the field hospital of the 1st division, Fifth Corps, and, about May 24th, sent to Washington, and admitted into the Carver Hospital. Simple dressings were used. On the 31st, the patient was transferred to the Mower

Hospital, Philadelphia. On August 5th, a large spicula of necrosed bone was removed. The wound gradually healed, and he was discharged from service, October 29th, 1864, and pensioned. In June, 1866, his pension was doubled. Pension Examiner S. Rhoades reported that there was great impairment of memory, sight, and hearing, and that, though he had no bad habits, this pensioner was very much debilitated and unfit for any mental or bodily labor.

Rea, Robert, S., Private, Co., F, 31st Ohio Volunteers, aged 22 years, received, at the battle of Chickamauga, September 19th, 1863, a gunshot contusion of the head. The wound of the scalp was slight. After a month's treatment at Hospital No. 1, Nashville, this man was returned to duty. Six months subsequently, he was sent to Camp Chase, Ohio, insane. He died on April 30th, 1864. The autopsy revealed a clot, the size of a filbert, and two small abscesses on the surface of the brain. The skull was not fractured.

Shand, John L., Corporal, Co. B, 93d Pennsylvania Volunteers, was admitted to the Ladies' Home Hospital, New York, August 2d, 1862, with a gunshot contusion of the skull. His mental faculties were impaired, and he was discharged from the service on September 17th, 1862, and pensioned. Pension Examiner W. M. Guilford reported, April 23d, 1863, that the wound had healed with a depressed cicatrix, and that there was a constant dull and heavy pain in the head.

Sweet, Oscar F., Private, 8th United States Infantry, was examined for a pension on April 15th, 1864. by Pension Examining Surgeon H. B. Day. He had received a gunshot wound of the cranium near the vertex, tearing the scalp and contusing the cranium. There was much mental aberration.

The following cases of gunshot wounds of the head, with contusion of the bones of the cranium, terminated fatally:

Caraker, J. V., Corporal, Co. D, 15th Alabama Infantry, received a wound of the frontal region, with injury of the bone. He was admitted, on October 14th, 1864, into the Howard Grove Hospital, Richmond, Virginia. There was much cerebral disturbance, and death took place, October 29th, 1864. The case is reported by Surgeon S. M. Palmer, P. A. C. S.

Carter, Joseph, Private, Co. A, 39th Illinois Volunteers, received, in an engagement on Morris Island, August 25th, 1863, a gunshot wound of the scalp. The missile, a conoidal ball, grazed the right parietal bone, and removed the periosteum. He was, on the following day, admitted on board of the steamer Cosmopolitan, where he died on August 26th, 1863.

Elliott, Estes E., Private, Co. G, 36th Massachusetts Volunteers, aged 21 years, received, at the battle of Cold Harbor, Virginia, June 3d, 1864, a wound in the left parietal region, denuding the bone of its periosteum, by a conoidal musket ball. He was admitted into the field hospital of the 3d division, Ninth Corps, and, a few days later, sent to Washington, and admitted into the Carver Hospital. Simple dressings were used. He died from concussion of the brain, June 23d, 1864.

Fink, Ira, Private, Co. C, 6th Maine Volunteers, received, in an engagement at Charlestown, Virginia, August 21st, 1864, a gunshot wound of the scalp, with contusion of the skull. He was sent to the hospital at Sandy Hook, Maryland, but died in transit, August 22d, 1864.

George, D., Private, Co. K, 1st Michigan Sharpshooters, aged 26 years, received, at the battle of Spottsylvania Court-house, Virginia, May 12th, 1864, a wound of the head, with contusion of the bone, in the right parietal region, by a conoidal musket ball. He was admitted into the field hospital of the 3d division, Ninth Corps, and transferred thence to Washington, and admitted, on May 25th, into the Emory Hospital. He died comatose on the following day. The case is reported by Surgeon N. R. Mosely, U. S. V.

Gibbs, Frank L., Private, Co. I, 21st Connecticut Volunteers, aged 26 years, was wounded, in an engagement before Petersburg, Virginia, August 1st, 1864, by a conoidal musket ball, which severely injured the scalp and contused the bone. He was admitted to the hospital of the 1st division, Eighteenth Corps, and, on August 4th, was sent to the hospital at Fort Monroe. The treatment, so far as recorded, was of an expectant nature. Death resulted from the injury on August 12th, 1864.

Hodges, W. T., Sergeant, Co. D, 66th Georgia Regiment, was admitted into Pettigrew Hospital, Raleigh, North Carolina, on March 11th, 1865, with a gunshot wound of the scalp, with contusion of the right parietal bone. The patient died on March 13th, 1865.

Long, C. H., Private, Co. C., 1st Maine Heavy Artillery, aged 19 years, was wounded, in front of Petersburg, Virginia, June 18th, 1864, by a conoidal musket ball, which produced a severe scalp wound, with contusion of bone. He was sent, June 22d, to the hospital of the 3d division, Second Corps, at City Point, and thence conveyed to Washington, and admitted, on June 24th, to Mount Pleasant Hospital. On June 27th, he was sent to the Cony Hospital at Augusta, Maine, where he died on July 16th, 1864.

Martin, Samuel, Private, Co. I, 15th Veteran Reserve Corps, was brought to the hospital at Camp Douglass, Illinois, on December 27th, 1864, from his regiment, with a gunshot scalp wound over the occiput. He died on December 30th, 1864. There was contusion of the bone externally. The encephalon was not examined.

Palmer, J. H., Corporal, Co. K, 10th Connecticut Volunteers, aged 26 years, was wounded, in an assault on the lines before Petersburg, Virginia, April 2d, 1865, by a conoidal musket ball, in the temporal region, the bone being contused, but not fractured. He was admitted to the hospital of the 1st division, Twenty-fourth Corps, and, on April 5th, was sent to the hospital at Fort Monroe. He died on April 11th, 1865, from compression of the brain.

Phillips, Albert S., Lieutenant, Co. I, 1st Delaware Volunteers, received, at the battle of Fredericksburg, Virginia, December 13th, 1862, a contused wound of the head by a fragment of shell. He was admitted into the field hospital of the 3d division, Second Army Corps, on the same day. Simple dressings were used. He subsequently went on leave of absence to his home, where he died, on January 14th, 1863. The case is reported by Surgeon D. W. Maull, 1st Delaware Volunteers.

ROSE, AUGUSTUS. Corporal, Co. B, 143d New York Volunteers, received, in the action at Atlanta, Georgia, July 20th, 1864, a severe wound of the scalp, with contusion of the cranium, and concussion of the brain. He was admitted, on the same day, to the hospital of the 1st division, Twentieth Corps, and on the 26th, sent to Hospital No. 3, at Lookout Mountain, Tennessee. Death resulted on the 1st of August, 1864.

RUFF, LEWIS F., Private, Co. C, 13th Ohio Volunteers, received, during the campaign around Atlanta, Georgia, a gunshot wound of the scalp, with contusion of the skull. He was, on September 2d, admitted to the hospital of the 3d division, Fourth Corps, and thence sent to the field hospital at Chattanooga, which he entered on September 8th. On September 17th, he was transferred to Hospital No. 14, Nashville, where he died, on October 1st, 1864, from concussion of the brain.

SMITHSON, J. D., Private, Co. B, 130th Indiana Volunteers, aged 28 years, was, on May 17th, 1864, admitted to Hospital No. 1, Chattanooga, Tennessee, with a gunshot scalp wound. He died on May 18th, 1864, and, at the autopsy, the brain was found contused near the seat of injury.

WEBER, ANDREW J., Colonel, 11th Missouri Volunteers, wounded, opposite Vicksburg, Mississippi, by a fragment of shell, which took effect on the crown of the head, laying bare the periosteum for an inch square. No fracture of the bone was perceptible. He never returned to consciousness, and died, on June 30th, 1863, twenty hours after the receipt of the injury, with symptoms rather of compression than of concussion.

WELD, S., Corporal, Co. K, 19th Maine Volunteers, aged 31 years, was wounded, at the battle of the Po River, Virginia, May 13th, 1864, by a conoidal musket ball, which struck at the vertex of the head, producing an open wound three inches in length and one in breadth, and denuding a portion of bone of its periosteum. He was admitted into the Mount Pleasant Hospital, Washington, from the field, May 16th, and thence transferred, on the 19th, to the hospital at Annapolis. Death resulted on June 5th, 1864. The case is reported by Surgeon B. A. Vanderkieft, U. S. V.

YAW, ANDREW, J., Private, Co. B, 157th New York Volunteers, received, at the battle of Gettysburg, Pennsylvania, July 1st, 1863, a gunshot contusion of the head, without fracture. He was admitted to the Seminary Hospital, Gettysburg, and, on July 25th, sent to the McDougall Hospital, New York Harbor. Death occurred from apoplexy on August 22d, 1863.

The eight following cases of gunshot contusions of the skull should probably be referred to the category of cases resulting in chronic irritability of the brain; but the details given in the reports are insufficient to determine their nature precisely:

BAKER, CHARLES C., Major, 39th New York Volunteers, was wounded, at the battle of North Anna river, Virginia, May 18th, 1864, by a fragment of shell, which caused a contusion of the right side of the head. He had bleeding from the nose and ears, and subsequently great vascular excitement, headache, and other cerebral derangements. He was treated at the hospital of the 1st division of the Second Corps, and thence, on May 21st, was sent to Washington, where he was examined by Acting Assistant Surgeon J. C. Nelson, who thought that the disabilities were likely to continue. On May 30th, this officer was mustered out of service. His name does not appear on the Pension List.

BEAM, ANSELL H., Corporal, Co. I, 26th Michigan Volunteers, aged 21 years, was wounded in the engagement at Farmville, Virginia, April 6th, 1865, by a conoidal ball, which made a ragged scalp wound to the right of the sagittal suture, with contusion of the parietal bone. He was admitted to the hospital of the 1st division, Second Corps, and on April 15th, was sent to the Harewood Hospital, Washington, where a photograph was made of his injury. On May 18th, he was transferred to the Satterlee Hospital, Philadelphia. He had many symptoms of disturbance of the brain. The scalp wound healed up favorably, and on July 6th, 1865, he was discharged from the service for disability. A photograph of the case, taken a few days after the reception of the injury, is preserved in the seventh volume of Surgical Photographs of the Army Medical Museum, at page five. It is copied in figure 1 of Plate III, (opposite p. 105.) It is probable that he completely recovered, since his name is not found on the list of applicants for pension.

BURKE, ELI, Sergeant, Co. A, 183d Pennsylvania Volunteers, aged 26 years, received a contusion of the skull from a fragment of shell which inflicted a large scalp wound and caused a grave contusion of the skull. He was removed from a field hospital to the Second Division Hospital at Alexandria on June 7th, and thence to the South Street Hospital, Philadelphia, on June 13th, 1864. He suffered from cerebral trouble, and was discharged from service on May 30th, 1865. There is no record of his case at the Pension Office.

COUCH, JAMES A., Sergeant, Co. D, 131st Pennsylvania Volunteers, was wounded, at the battle of Fredericksburg, Virginia, December 13th, 1862, by a conoidal musket ball which struck the upper part of the left occipital bone. He was stunned for a few moments, and was hardly able to stagger from the field. He was admitted to the Armory Square Hospital on December 20th, complaining of pain in the head; he was easily confused, otherwise, his condition was normal. He was returned to duty on May 12th, 1863. His name does not appear upon the Pension List.

DERR, JACOB, Private, Co. A, 82d Pennsylvania Volunteers, aged 20 years, received, at the battle of Cold Harbor, Virginia, June 3d, 1864, a gunshot wound of the left side of the scalp. He was conveyed to the Second Division Hospital, Alexandria, Virginia; on June 12th, sent to the hospital at Chester, Pennsylvania, and on July 11th, 1864, returned to duty. On July 18th, 1864, he was admitted to the Lincoln Hospital, Washington, D. C., with secondary symptoms of concussion of brain. He recovered, and was returned to duty on February 7th, 1865. He is not recorded as an applicant for pension.

ENGLEHART, LOUIS, Private, Co. E, 59th New York Volunteers, received a gunshot wound of the scalp, grazing and bruising the cranium. He was admitted to Douglas Hospital, Washington, on December 12th, 1863, suffering from concussion of the brain. He recovered, and was sent to the Provost Marshal on February 6th, 1864.

KYLE, JOHN W., Private, Co. F, 12th Pennsylvania Reserve Corps, received a gunshot wound of the scalp above the right eye, with contusion of the frontal bone and concussion of the brain. He was admitted into Carver Hospital, Washington, September 1st, 1862, and was discharged from the service, November 5th, 1862. His name is not upon the Pension Rolls.

Wiley, Jacob S., Co. K, 18th South Carolina Regiment, received, in an engagement before Petersburg, Virginia, May 20th, 1864, a gunshot wound of the right parietal bone. He was admitted, on May 23d, to the Confederate hospital at Petersburg, Virginia, and furloughed on June 13th, 1864, suffering from congestion of the brain.

Pyæmia.—Theoretical considerations would lead to the belief that purulent infection, with metastatic foci or visceral abscesses, would be common in gunshot contusions of the skull, in consequence of the entrance of pus into the veins of the diploe in the vicinity of exfoliations. But the returns do not sustain this supposition, and present, indeed, but a single case in which the existence of pyæmia is distinctly alleged:

BROWER, G., Sergeant, Co. F, 16th Ohio Volunteers, received, at the siege of Vicksburg, Mississippi, December 28th, 1862, a gunshot wound of the scalp, in the right occipital region, with contusion of the bone. He was conveyed to Paducah, Kentucky, on the hospital steamer City of Memphis, and admitted, on January 13th, into the St. Mark's Hospital. There was paralysis of the left leg. Pyæmia supervened, and death took place, February 21st, 1863. The case is reported by Surgeon H. P. Stearns, U. S. V.

Tetanus.—But one instance of the occurrence of this complication is reported among the gunshot contusions of the cranium:

KRALL, CHRISTIAN, Private, Co. K, 130th Pennsylvania Volunteers, was wounded, at the battle of Fredericksburg, Virginia, December 13th, 1862, by a musket ball which caused a contusion of the outer table of the right parietal bone above and behind the protuberance. The concussion was slight, not even knocking him down, or causing any disturbance of his mental faculties. Excessive hæmorrhage followed the injury, which was not arrested for five hours. He was, on December 17th, admitted to the Patent Office Hospital, Washington, D. C., and on December 19th, sent to the Jarvis Hospital at Baltimore, Maryland. On admission, the wound looked healthy, and discharged normal pus. No fracture could be detected, but the bone was denuded of periosteum. On December 24th, symptoms of tetanus, confined chiefly to the muscles of the neck, supervened, followed by nausea and vomiting. January 1st, 1863, tetanus was general and well-marked. The wound was extremely sensitive, and the scalp around it puffed, indicating a burrowing of pus. The pains in the head became intolerable, and, during the intervals of the spasmodic throes, he would scream and groan. A free incision of the scalp was made, and the fresh wound allowed to bleed unchecked for some time. Instantaneous relief followed, the pain in the head abated, and the spasms did not recur the following morning. Still no fracture could be detected, but the parietal bone was somewhat roughened, and was evidently exfoliating. On the following day the symptoms had returned. Opium was given, and afterward, cannabis indica was substituted, with some benefit. Death occurred on January 4th, 1863. At the autopsy, a film of pus was found under the dura mater, beneath the point of injury, amounting to a half drachm. The dura mater was bruised and discolored; the substance of the brain was normal, but a small quantity of bloody serum existed in the lateral ventricles. The pathological specimens were sent to the Army Medical Museum. One of them is represented in the adjacent wood-cut, (FIG. 36.) It consists of the vault of the cranium, showing incipient caries and necrosis of the outer table of the right parietal bone. The scale of bone, around which the line of demarcation has formed, is elliptical in shape, measuring one inch by one and a half. The inner table presents no pathological appearance. The second specimen is a wet preparation of the dura mater, thickened, inflamed, and having a deposit of pus upon its inner surface. The specimens and history were contributed by Assistant Surgeon D. C. Peters, U. S. A.

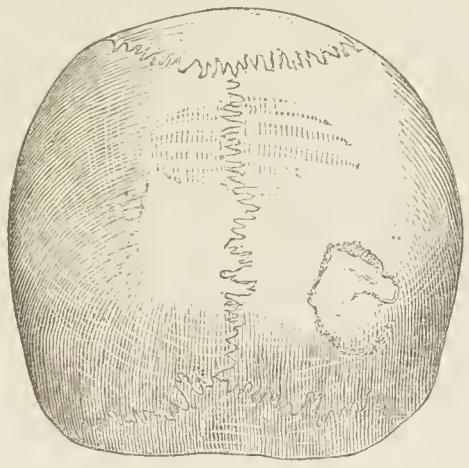

FIG. 36.—Exfoliation from the right parietal, from gunshot contusion. *Spec.* 613, Sect. I. A. M. M.

Trephining.—There were sixteen cases of gunshot contusion of the cranial bones, in which necrosed fragments were removed by formal operations:

ABBOTT, HENRY, Private, Co. B, 32d Maine Volunteers, aged 21 years, was wounded, at the battle of Tolopotomy Creek, Virginia, May 31st, 1864, by a conoidal ball which struck the right parietal bone, passed forward and downward, exposing the squamous suture, and lacerating the scalp for a distance of three inches. He was at once admitted to the hospital of the 2d division, Ninth Corps, and, on June 4th, was sent to the Stanton Hospital, Washington. On the 7th, diarrhœa set in, but soon yielded to treatment. His general health continued good, and by the 17th the wound had nearly healed. On July 12th, a piece of necrosed bone from the outer portion of the temporal suture and the diploe, one inch in length and half an inch in breadth, was removed, and on the 14th, another portion, corresponding to the first, and consisting of the inner table, was removed. He was transferred on July 18th, entering Grant Hospital, Willet's Point, New York Harbor, on the 21st, whence, he was returned to duty on the 21st of December, 1864. The case is reported by Surgeon John A. Lidell, U. S. V. The recovery appears to have been complete, as the man's name does not appear on the list of applicants for pensions.

FIG. 37.—Exfoliations resulting from gunshot contusion of the cranium. *Spec.* 4943, Sect. I, A. M. M.

FIG. 38.—Internal view of the foregoing specimens.

UNKNOWN. An infantry soldier, on the Peninsula, in June, 1862, received a scalp wound from a glancing musket ball, on the side of the head, with contusion of the parietal bone. He was treated by Assistant Surgeon Wm. Thomson, U. S. A. There were very grave head symptoms, yet the case was treated on the expectant plan. After a while, it was noticed that the external table of the skull was necrosed, and, subsequently, that two fragments, one comprising the whole thickness of the bone, the other, the outer table and diploe only, were loosened and detached. These being removed, the patient recovered without any impairment of the mental faculties or physical disability. The specimens, represented of natural size in the adjoining wood-cuts, (FIG. 37 and FIG. 38,) were sent to the Army Medical Museum by Assistant Surgeon W. Thomson, U. S. A., who lost his notes of the case in the retreat from the Peninsula.

FIG. 39.—External and internal view of an exfoliation of the cranium following gunshot contusion. *Spec.* 2623, Sect. I, A. M. M.

UNKNOWN. A soldier, wounded in one of the battles between the Wilderness and Petersburg, in May, 1864, receiving a laceration of the scalp, with contusion of the vault of the cranium, by a musket ball. He was sent to an hospital in Philadelphia. The bone, at the point at which the pericranium was denuded, necrosed and exfoliated, and was removed by operation. The specimen was received at the Army Medical Museum, without an history, on June 22d, 1864. It is figured at natural size in the adjacent wood-cut, (FIG. 39.)

YETTER, JOHN, Private, Co. A, 11th New Jersey Volunteers, aged 21 years, was wounded near Petersburg, Virginia, November 10th, 1864, by a conoidal ball which lacerated the scalp, and contused the anterior portion of the left parietal bone. He was admitted to the field hospital of the 3d division, Second Corps, and thence transferred to City Point, and thence sent by the hospital steamer Connecticut to the Stanton Hospital, Washington, where he arrived on November 26th. There was a necrosis of the cranium, one-fourth of an inch in diameter. Low diet and gentle purgatives were prescribed, and, as suppuration became tolerably well established, emollient poultices were applied to the wound. On the 21st of December, the contused bone had become loosened by the process of absorption and suppuration. The patient was placed under the influence of chloroform, and Surgeon Benjamin B. Wilson, U. S. V., made a crucial incision, and removed a piece of the external table of the parietal bone, half an inch in diameter, and another, from the internal table, one-fourth of an inch in diameter. On the 29th, another piece of bone, including a small portion of both tables, was removed from the inferior margin of the wound. Water dressings were applied. The patient made a rapid recovery, without any untoward symptom; but it was thought inexpedient to return him immediately to active service in the field. He did efficient duty for some months as a nurse in the hospital. When discharged, on the general muster-out of troops, June 15th, 1865, he was in excellent health. His name does not appear on the list of applicants for pension. The specimen (see FIG. 40) and notes of the case were contributed by Surgeon B. B. Wilson, U. S. V.

FIG. 40.—Fragments of necrosed bone from the left parietal. *Spec.* 4178, Sect. I, A. M. M.

Altman, Samuel, Private, Co. A, 50th Georgia Regiment, was wounded, at the battle of Antietam, September 17th, 1862, by a musket ball which laid bare the frontal bone to the extent of two inches in length by three-fourths of an inch in width, but not depressing or fracturing the bone. He was admitted into the Convalescent Hospital, Philadelphia, September 27th, 1862. The wound granulated rapidly, and the patient was apparently doing well, exhibiting no symptoms of injury to the brain, except that he was sullen and stupid, which was attributed to other causes. On October 6th, he complained of headache, chills and fever, and, on the 8th, cerebral symptoms appeared, and rapidly increased until the 11th, when indications of approaching dissolution were unmistakable, the pulse being rapid and small, pupils natural, but insensible to light. The patient was etherized, and the operation of trephining performed, to evacuate an abscess supposed to exist. A piece of bone was removed, and the brain punctured, giving exit to six or seven ounces of offensive sero-purulent fluid, containing fragments of broken down brain tissue, with such a force as to throw it three feet from the patient. The effect of the operation was favorable; the skin became warm, the pulse gained strength and was less rapid, the breathing was easier, and the patient appeared in every way better. The wound was closed, and stimulants were administered, but exhaustion followed, and death occurred on October 11th, 1862. At the autopsy, it was found that the ball had struck the os frontis on the left side, near the sagittal suture, two and a half inches from the middle line of the cranium. The inner table was necrosed over an irregular circular space, one and a half inches in diameter, the diploe between the outer and inner tables at

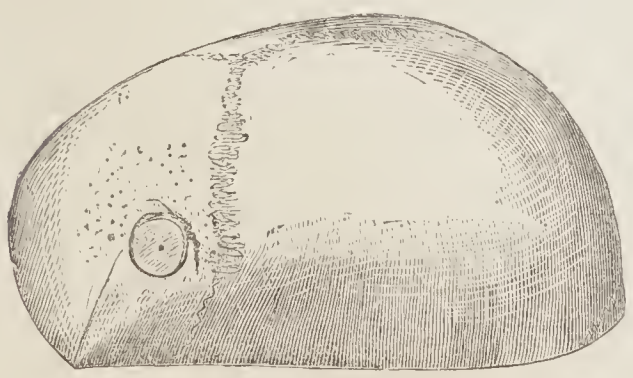

FIG. 41.—Calvaria trephined in the left frontal region for gunshot contusion. *Spec.* 1129, Sect. I, A. M. M.

this point being carious. There was an abscess, with greenish indurated walls, three inches in diameter, in the anterior lobe of the left cerebral hemisphere. It had opened, and its contents had filled the cavities of the brain. There was no pus under the diseased bone upon the surface of the brain, nor did there seem to be any immediate communication between the diseased bone and the abscess. The pathological specimen is figured in the foregoing wood-cut, (FIG. 41.) It shows the vault of the cranium, with the disk in place. The internal table is cribriform. The outer table is porous, and discolored to a slight degree. The specimen and history were contributed by Acting Assistant Surgeon G. R. Morehouse.

ATTIG, WILLIAM, Private, Co. A, 49th Pennsylvania Volunteers, aged 25 years, was wounded, near Rappahannock Station, Virginia, November 7th, 1863, by a conoidal musket ball which struck the forehead near the left frontal eminence, denuding the bone of its periosteum for about one inch. He was conveyed to Washington, and admitted into Harewood Hospital on the 9th, complaining of slight headache over the region of the eyes. His pulse was normal, and his appetite poor. On the 17th, chills, with vomiting, supervened, and the eyes became lachrymose. These symptoms continued until the 19th, when he was anæsthetized, and Surgeon R. B. Bontecou, U. S. V., made a crucial incision through the scalp, when pus was found issuing through the denuded bone. The trephine was then applied near the left frontal eminence, giving exit to a small quantity of pus, which was found between the dura mater and the skull. After the operation, the patient became free from pain. During the night of the 20th, he became delirious, and lay in a stupor nearly all the time, but answered questions correctly. The next morning, the forehead and right eye-lids were œdematous, and the pulse was 75, and feeble. On the 23d, low muttering delirium followed, coma ensued, the alvine evacuations became involuntary, and his breathing stertorous. At eleven o'clock A. M. of the 24th, the dura mater was incised, giving exit to a small quantity of pus, but no relief was afforded, and death occurred two hours subsequently. The pathological specimen was sent to the Army Medical Museum, and is represented in the wood-cut (FIG. 42). It was forwarded, with its history, by Surgeon R. B. Bontecou, U. S. V.

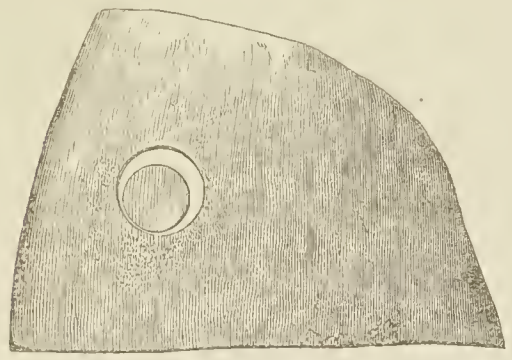

FIG. 42.—Perforation of the left os frontis for a gunshot contusion, followed by symptoms of compression. *Spec.* 2024, Sect. I, A. M. M.

BAKER, CHARLES K., Private, Co. D, 27th Massachusetts Volunteers, aged 25 years, was wounded, at the battle of New Berne, North Carolina, March 14th, 1862, by a conoidal musket ball which made a long furrowed wound of the right parietal region, lacerating the scalp, and denuding the pericranium. He was treated at a field hospital by his regimental surgeon. The right side of the scalp was shaven, and a compress, dipped in cold water, was secured over the wound by a bandage. The patient was required to keep his bed in the log hut used as an hospital, and to observe a strict diet. He had no headache, nor any symptom of disturbance of the brain. Careful exploration revealed no injury of the bone. On March 20th, the wound of the scalp was fairly cicatrizing, and the patient was sent on an hospital transport, up the Neuse river, to the Carver Street Hospital at New Berne, five miles distant. Two days subsequently, through the inadvertence of an hospital steward, this man's name was included in the list of wounded to be sent northward on the hospital transport steamer New York. Surgeon J. B. Upham, in charge of the transport, reports that he had no cerebral symptoms on the passage. He proceeded to his home in Amherst, Massachusetts. On April 3d, he complained of headache, and the following day symptoms of compression of the brain were manifested. On April 7th, he was trephined by two of the local practitioners, and died a few hours after the operation. Assistant Surgeon D. B. N. Fish, 27th Massachusetts Volunteers, a resident of Amherst, writes, in 1868, that the two surgeons who performed the operation had died and left no notes of the case; but thinks it certain, from the report of one of the witnesses of the operation, that a clot of blood was found underneath the cranium, at the point of impact.

CHAPMAN, S. D., Private, Co. H, 92d Ohio Volunteers, received, at the battle of Chickamauga, September 23d, 1863, a gunshot wound of the scalp, near the upper posterior angle of the right parietal, with a contusion of the bone. He was sent to Nashville, and admitted to Cumberland Hospital on the 25th. The wound produced little inconvenience until October 4th, when grave head symptoms, such as delirium and convulsions, supervened. There was hemiplegia also. On October 5th, the patient was in a comatose condition, and trephining was resorted to. When the skull was perforated, exit was given to a quantity of pus, which had formed between the dura mater and cranium. Consciousness was restored almost immediately, and apparent steady improvement for the next twenty-four hours; but symptoms of compression then recurred, and the patient died on October 9th, 1863. At the autopsy, the right hemisphere was found partially disorganized, and covered with a layer of pus, which extended to the longitudinal fissure. The operator, Surgeon C. McDermont, U. S. V., reported the case.

CHAPPEL, BENJAMIN F., Sergeant, Co. H, 8th New York Cavalry, aged 27 years, was wounded, before Petersburg, Virginia, April 1st, 1865, by a pistol ball which entered one inch above and one and a half inches to the left of the occipital protuberance and emerged just below it on the opposite side, denuding the bone of pericranium. He was admitted to the hospital of the 3d division, Cavalry Corps, and on the 3d, was sent to Washington, where he entered Harewood Hospital on the 5th. Until the 14th, the patient seemed to be improving, but on that day a slight hæmorrhage from the occipital artery occurred, causing the loss of about six ounces of arterial blood. The hæmorrhage was arrested by means of compression, and the case apparently progressed favorably. On the evening of the 18th, the patient, however, complained of considerable pain in the region of the cerebellum. On the following day considerable gastric irritation manifested itself, and, at intervals, there was slight delirium. Ether was administered, and Surgeon R. B. Bontecou, U. S. V., made an incision two and a half inches in length, just below and parallel to the lambdoidal suture, retracted the scalp, applied the trephine, and removed a disk of bone, giving exit to a quantity of pus. The patient reacted promptly, after the operation, and seemed to be much relieved, but in the

evening he began to sink, and died on the morning of April 21st, 1865. The autopsy revealed a large abscess in the left lobe of the cerebellum, which contained four or five ounces of pus. The medulla oblongata was implicated. The pathologieal specimen is represented in the adjacent wood-cut, (FIG. 43,) and shows the oceipital bone perforated by a trephine, with the disk restored to its position. The surrounding portion of the external table is slightly discolored and eribriform. The speeimen was eontributed by the operator. A photograph of the ease will be found in the Photographie Surgieal Series of the Army Medical Museum, Volume I, page 40.

FIG. 43.—Segment of a cranium, showing the occipital perforated for the evacuation of pus. *Spec.* 4348, Sect. I, A. M. M.

FOSTER, JAMES B., Private, Co. F, 5th Missouri Militia, was, on August 25th, 1863, admitted to the hospital at Kansas City, Missouri, with coneussion of the brain. The skull was not fractured, but there were symptoms of eompression. The trephine was applied to the seat of injury, and a button of bone removed. The operation revealed a rupture of the middle meningeal artery, with copious hæmorrhage. A clot of blood was removed from under the pia mater, when clear blood eseaped for a few minutes. Death oeeurred on August 27th, 1863, thirty hours after the operation. The autopsy revealed extravasation of blood over the entire surface of the brain. The report is signed by Dr. Joshua Thorne.

Gay, J., Private, Co. A, 44th Georgia Infantry, received a gunshot wound of the sealp. He was admitted into the Jaekson Hospital at Richmond. Paralysis supervened, and trephining was resorted to on June 2d, 1864. Death took place on June 4th. The case is reported by Surgeon J. S. Welford, C. S. A.

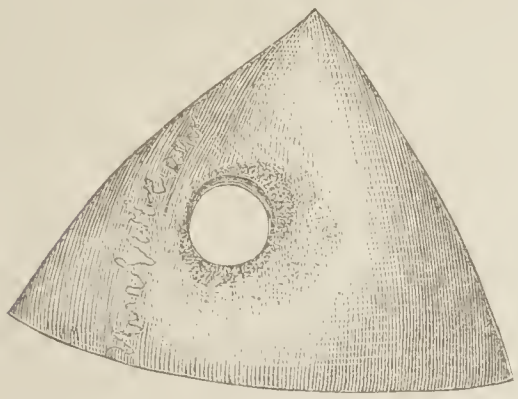

FIG. 44.—Segment of the right parietal, trephined near the coronal suture. *Spec.* 334, Sect. I, A. M. M.

MORTON, DARIUS, Private, Co. F, 9th New York Cavalry, was wounded in a skirmish during General Pleasonton's raid into Virginia, and was admitted, on November 12th, 1862, to the Armory Square Hospital, Washington, with a gunshot wound of the sealp, with eontusion. No particulars of the treatment are recorded. Compression of the brain supervened, and the operation of trephining was performed by Surgeon D. W. Bliss, U. S. V. The symptoms of compression were not relieved, and the patient died on November 18th, 1862. The pathological specimen was forwarded to the Army Medical Museum. It eonsists of a segment of the right parietal bone, of a very thin calvaria, trephined near the coronal suture. The outer table of the bone surrounding the perforation is porous and cribriform, and there are traces of contusion of the disk removed. There are no pathological appearances on the inner table. The specimen, which is represented in the adjacent wood-cut, (FIG. 44,) was contributed by the operator, Surgeon D. W. Bliss, U. S. V.

PICKARD, GEORGE, Private, Co. F, 111th New York Volunteers, aged 48 years, was wounded in the head, at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a piece of shell. He was taken to the regimental hospital, transferred to the Seminary Hospital, Gettysburg, Pennsylvania, and thence sent to the McDougall Hospital, Fort Schuyler, New York Harbor, where he was admitted on the 12th. Cold water dressings were applied, and an antiphlogistie treatment ordered. The patient complained of headache and of stiffness in the cervical region. On July 19th, he became comatose, with fixed pupils, and stertorous breathing. On the 20th, Acting Assistant Surgeon Henry Sanders applied the trephine, giving exit to a small quantity of pus, after which the patient rallied a little, but sank again at night, notwithstanding the free use of stimulants, and died on July 22d, 1863. The autopsy revealed inflammation of the membranes of the brain, and several ounces of pus beneath them. There was pus also on the external surface of the dura mater. The tissue of the brain itself was normal. The case was reported by the operator.

RESINGER, JOSEPH, Private, Co. E, 151st New York Volunteers, aged 21 years, received, at the demonstration on Mine Run, Virginia, November 27th, 1863, a gunshot wound of the scalp, over the right parietal. He was conveyed to Fairfax Seminary Hospital. There was no cerebral disturbance at the time of his admission. The pericranium was not removed, and it was hoped that the skull had escaped uninjured. He was allowed to be up and about the wards, and no symptoms of any grave injury appeared until December 13th, 1863, when he was suddenly seized, while seated at the supper table, with convulsions, and became immediately unconscious. He was taken to his bed, and Surgeon D. P. Smith, U. S. V., laid bare the calvarium at the seat of injury, and applied the trephine. Pus was found immediately beneath the bone and oozed from the diploe. It was thought expedient to make five perforations with the trephine, in order to remove the diseased bone, and to give free exit to pus. Convulsions did not recur, but the comatose condition continued, and the case terminated fatally twelve hours after the operation. The autopsy revealed diffuse inflammation of the arachnoid and of the dura mater. The dura mater was not incised, as it did not bulge into the perforations made by the trephine. The pus proceeded altogether from the diploe and from between the dura mater and the skull. The specimen was contributed by the operator to the Army Medical Museum, and is figured in the adjoining wood-cut, (FIG. 45.)

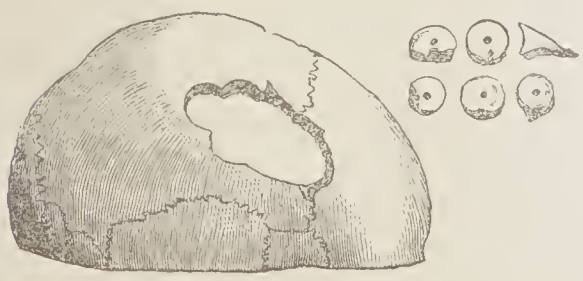

FIG. 45.—Section of a cranium, exhibiting five trephine perforations for the evacuation of pus, the result of a gunshot contusion of the right parietal. *Spec.* 2000, Sect. I, A. M. M.

Spradley, L. D., Private, Co. H, 45th Georgia Regiment, was wounded, at the battle of the Wilderness, May 5th, 1864, by a conoidal musket ball which produced a wound of the head, with denudation of the bone of the vault of the cranium. He

was conveyed to the general Confederate hospital at Charlottesville, Virginia. On May 12th, symptoms of compression of the brain appeared, and, on the following day, trephining was resorted to. The patient died May 13th, 1864, a few hours after the operation. The case is recorded in his monthly report for May, 1864, by Surgeon J. L. Cabell, C. S. A.

Williamson, L. B., Corporal, Co. G, 100th Pennsylvania Volunteers, aged 23 years, was wounded, before Petersburg, Virginia, April 2d, 1865, by a conoidal musket ball which injured the cranium. He was admitted on the same day to the hospital of the first division, Ninth Corps, and thence was sent to the hospital at Fairfax Seminary, which he entered on April 6th. On April 12th, the operation of trephining was performed. No particulars in regard to the operation and the after-treatment are recorded. Death ensued on April 20th, 1865.

Thus, of sixteen cases of operative interference, four only had a favorable termination, and these were examples of the secondary removal of exfoliated fragments, Art serving as the handmaid of Nature, who had already nearly effected a cure. In the twelve remaining fatal cases, in which formal trephining was resorted to, pus was found between the skull and dura mater in four instances, beneath the dura mater in one case, and in the substance of the brain in one. In two instances, it is alleged that intra-cranial extravasation was observed; in another that arachnitis was present; in three cases the causes of the symptoms of compression were not specified. Its symptoms were manifested earliest in those cases in which hæmorrhage in the cranial cavity was observed. In the six cases in which pus was found, the symptoms of compression arose from the sixteenth to the twenty-fourth day. The patients survived the operations on an average about three days.

Of the whole number of three hundred and twenty-eight patients with gunshot contusions of the cranial bones, whose cases have been reported, fifty-five died, one hundred were returned to duty, and one hundred and seventy-three were discharged. Forty-eight of the last category were pensioned.

In the fifty-five fatal cases, the proximate causes of death were external hæmorrhage in two cases; tetanus, pyæmia, intercurrent typhoid fever, and acute dysentery respectively in four cases at least, compression of the brain from extravasated blood or from intra-cranial abscess in seventeen cases, and various secondary lesions of the encephalon in thirty-two cases.

The wounds were inflicted by small-arm projectiles in one hundred and twenty-four instances, by shell fragments in forty-four cases, and in one hundred and sixty cases, the nature of the missile could only be conjectured. Lodgment of the missile beneath the scalp is mentioned in eight instances.

The seat of injury was specified in two hundred and twenty-one instances. In fifty-four, the frontal bone was struck; in thirty-three, the temporal; in ninety-five, the parietal; in thirty-three, the occipital; and in six cases, the contusion involved more than one of the cranial bones. The fatality in contusions of the frontal and temporal bones was nearly fifteen per centum; in contusions of the parietals, thirteen; and in contusions of the occipital, nine per centum; results corroborating the observations of Guthrie on the relative danger of injuries of the different regions of the skull.*

In the classification, the cases have been grouped under the headings representing the most prominent symptoms, or the causes of discharge or death which they illustrated. Thus, though three cases only are entered under the heading of *Hæmorrhage* (p. 101,) there were at least two others, (cases of Krall, p. 122, and Chappel, p. 124,) in which

* Guthrie. *Commentaries on the Surgery of the War in Portugal, Spain, France, and the Netherlands, from the Battle of Roliça, in* 1808, *to that of Waterloo, in* 1815, *with Additions relating to those in the Crimea, in* 1854–55. *6th London ed.*, 1855, *p.* 299.

bleeding from the arteries of the scalp was an important complication. The five were all instances of hæmorrhage from direct injury of the occipital or temporal arteries or of the principal branches. The bleeding was primary in two cases, and secondary in three cases. The observations on page 64, on hæmorrhage after scalp wounds would be applicable to these five cases, save that in one of them it was necessary to ligate the temporal artery.

Erysipelas appears to have been neither a frequent nor fatal complication. In only four cases, (*Smith*, p. 102, GILKEY and HAY, p. 105, PULLIAM, p. 107,) in addition to the six cases recorded under the heading on page 101, is it reported as a serious intercurrent affection, and only two of the aggregate of ten cases terminated fatally. Sloughing of the scalp was seldom observed.

Burrowing of pus in the scalp or beneath the aponeuroses of the occipito-frontalis or crotaphite muscles was reported in only six of the three hundred and twenty-eight cases. Four of the six cases had a favorable issue ultimately, after the elimination of dead bone; in two, the abscesses were associated with other lesions which proved fatal. Early incision, followed by warm emollient applications, and subsequent gentle compression by bandages, constituted uniformly the treatment.

Periostitis following gunshot contusions of the cranium resulted occasionally in caries, not infrequently in necrosis, rarely in hyperostosis and induration, sometimes in persistent pain at the point struck. There were several examples of inflammation of the pericranium in which the wounds reopened at intervals and suppurated, yet no exfoliation followed. There were ten cases in which persistence of pain, either in the cicatrices or in distinct spots of the cranium, constituted the prominent symptom. Three of them belong to the class of cases described by Quesnay.* All of these patients were spared the incisions of the scalp or the application of the rugine or trephine, and five recovered and went to duty, while five were discharged for disability, two of whom were subsequently pensioned. I have carefully examined more than forty crania contused by gunshot projectiles without finding an example of the local hyperostosis of the skull which authors describe as a frequent result of this form of injury. There were two instances in which there was abnormal thickening, (*Spec.* 1199 and 1660 A. M. M.,) but the subjects who furnished these specimens died in twenty-one and twenty-seven days respectively after the reception of their wounds, and it is scarcely possible that the pathological conditions of the skulls were due to such recent injuries.† The induration or eburnation of the outer table mentioned by Rokitansky‡ as a consequence of contusion, was observed in six or seven of the fatal cases. It is very well illustrated in Specimens 1568, 2523, and 3406, of the Surgical Section of the Army Medical Museum. A few specimens showed traces of the velvety osteophyte described by Lobstein.‖

The contusions of the skull by gunshot projectiles were followed by exfoliations in thirty-seven cases. Five of these terminated fatally. Eight cases of this category were those of Confederate soldiers, who so far recovered as to be furloughed or discharged. Of the twenty-five Union soldiers who recovered, twelve had their names on the pension list

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* QUESNAY, *Mémoires de l' Académie Royale de Chirurgie.* Nouv. ed. Paris, 1819. T. 1, p. 169.

†Specimens 5135, and 5481, Section I, A. M. M., are good examples of chronic thickening of the skull from external violence, and specimen 55 of Section IV, is another fine illustration. But the bruises which were the starting point of the morbid alterations in these cases were from blows or falls.

‡ROKITANSKY, *Lehrbuch der Pathologischen Anatomie. Wien*, 1856, Zweiter Band, *S.* 144.

‖ LOBSTEIN, *Traité d'Anatomie Pathologique.* Paris, 1833.

in 1870. In six of the thirty-seven cases, the exfoliation included both tables of the skull, in thirty cases the outer plate only, and in one (Smith, p. 112) the inner table only. It is questionable if the latter case should not be regarded as a fracture of the inner table.*

In the few cases of caries observed, the disease soon followed the injury, there being no instance of its tardy apparition, as described by Sir Charles Bell.†

Of the one hundred and seventy-three patients in this category discharged, ninety-eight were discharged for serious physical disabilities, such as protracted headache and vertigo, persistent pain at the point struck, epilepsy, paralysis, impairment of the special senses or mental faculties. Forty-eight of these patients remain on the pension list. Some were discharged on account of other wounds or mutilations more serious than the head injuries, and others at the expiration of their terms of service. It may be stated as a near approximation to truth, that of three hundred and twenty-eight examples of gunshot contusions of the cranial bones, fifty-five, or seventeen per centum, died, ninety-eight, or thirty per centum, were disabled from causes referable to the injuries of the head, and one hundred and seventy-five, or fifty-three per centum, recovered.

Gunshot Fractures of the External Table of the Cranium alone.—With the exception of instances of fracture of the outer wall of the frontal sinus, or of the mastoid and zygomatic processes of the temporal, and of grooving of the outer table of the vault of the skull by the sharp angles of shell fragments, the specimens of the Army Medical Museum exhibit no satisfactory examples of this form of injury. Though the reports contain many cases returned under this heading, there are few in which the evidence of the nature of the injury is conclusive. The following are reported as examples of fractures of the external wall of the frontal sinus:

Case.—Private George Armstrong, Co. E, 156th New York Volunteers, received, before Port Hudson, Louisiana, on June 14th, 1863, a gunshot wound over the right eye. The missile struck over the right frontal sinus, causing a small wound. He was admitted to St. Louis Hospital, New Orleans, on June 17th, 1863, a slight exfoliation causing no inconvenience or complaint. On the night of September 16th, stupor supervened, but passed off in about thirty minutes. It recurred on the following day, and the patient died on September 18th, 1863. At the autopsy, the whole anterior half of the right hemisphere was replaced by a large abscess, which was divided only by the dura mater from the carious opening consequent upon the wound.

Case.—Private William S. Dingman, Co. F, 10th Vermont Volunteers, aged 26 years, was wounded at the battle of Winchester, Virginia, September 19th, 1864, by a fragment of shell which fractured the outer table of the frontal sinus. He was admitted to the 3d division, Sixth Corps, hospital, and on the 24th, sent to the Frederick hospital, Maryland, but shortly afterwards transferred to the Sloan Hospital, in Vermont. The wound healed and the patient was discharged from service on May 22d, 1865, at Brattleboro'. In September, 1867, he was in receipt of a pension. In March, 1869, Dr. O F. Fossett reported that this pensioner, having had a fracture involving the frontal sinus, had ulceration with a discharge of fetid sanious matter in the nose, with partial loss of vision and much pain and dizziness, incapacitating him for labor, and producing a disability rated at three fourths, without likelihood of improvement.

Case.—Sergeant Major Edwin A. Gordon, 57th Ohio Volunteers, was wounded near Vicksburg, Mississippi, December 29th, 1862, by a gunshot missile which fractured the external table of the frontal bone over the right eye. He was on the same day admitted to the hospital steamer City of Memphis. He recovered rapidly, was, on January 17th, 1863, admitted to the Lawson Hospital, St. Louis, Missouri, and returned to duty on April 2d, 1863. His pension claim is reported as pending.

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*Williamson informs us that: "Eleven cases of this description of injury, (detachment of pericranium by gunshot injuries), were admitted from India, of whom six were sent to duty and five invalided for other diseases. In all of them small portions of the external table of the skull came away necrosed. The scalp was not adherent to the bone in any of them." See Specimens 2895, 2896, and 3626, Netley Museum. *Military Surgery*, London, 1863, p. 19.

†Sir Charles Bell, *A System of Operative Surgery*, 2d ed. London, 1814. Vol. I, p. 381: "The surgeon should be aware of the slow progress and gradual effect of caries of the skull after contusion. When the bone has been injured, but not deadened, it falls slowly into disease; it becomes carious and spongy, and admits the oozing out of matter. The dura mater does not separate from the bone, as in the more common case of death of the bone from injury; but being the internal periosteum of the bone, it partakes of its disease, and grows into its carious cells. This is a disease of the skull, like to the common diseases of bones, where the external and internal periosteum, and substance of the bone, is diseased with decay of internal parts, and the formation of exostosis."

CASE.—Private William Gritzmacher, Co. C, 5th Wisconsin Volunteers, aged 19 years, was wounded at the battle of Spottsylvania, Virginia, May 12th, 1864, by an explosive musket ball which struck the frontal bone at the left supra-orbital ridge and fractured the outer table. He was, on the same day, admitted to the hospital of the 1st division, Sixth Corps, and on the 17th sent to Washington, D. C., and admitted into the Emory Hospital. On June 6th he was transferred to the Patterson Park Hospital, Baltimore, and on August 16th to the Chester Hospital. The treatment so far consisted of simple dressings. He recovered, and was transferred on May 16th, 1865, to the Veteran Reserve Corps, and discharged the service of the United States July 22d, 1865. Pension Examining Surgeon John Phillips reports, on May 9th, 1867, that this pensioner's wounds were still discharging, and that the right upper eyelid was so contracted as to prevent closure of his eye, and that his vision was impaired.

CASE.—Corporal D. Hagerty, Co. F, 69th Pennsylvania Volunteers, aged 33 years, was wounded at the battle of Gettysburg, Pennsylvania, July 3d, 1863, by a conoidal musket ball which fractured the external table of the frontal bone. He was conveyed on July 6th, to the Cuyler Hospital. He recovered, and was transferred to the Veteran Reserve Corps on May 12th, 1864, but was readmitted into the hospital on May 22d, and finally discharged from service on August 24th, 1864. A fistulous opening in the frontal sinus still existed. The case is reported by Assistant Surgeon H. S. Schell, U. S. A. The name of this patient is not upon the list of applicants for a pension.

CASE.—Private *E. D. Johnson*, Co. F, 1st North Carolina Infantry, received a wound of the frontal region, directly over the sinus, with fracture of the external table of the bone, by a fragment of shell. He was admitted into the No. 3 Chimborazo Hospital, Richmond, on June 4th, 1863, and on June 27th transferred to Weldon, North Carolina. The case is reported by Surgeon E. H. Smith, P. A. C. S.

CASE.—Private Henry Koelling, Co. C, 47th Illinois Volunteers, was wounded at the battle of Shiloh, Tennessee, April 7th, 1862, by a fragment of shell which struck in the left supra-orbital region, causing a comminuted fracture of the external table of the frontal bone, and opening the frontal sinus. He was conveyed on the hospital steamer D. A. January, to St. Louis, and admitted, on April 14th, into the new House of Refuge Hospital. There was occasional vertigo and constant headache. A large depressed cicatrix was visible at the seat of injury. He was discharged from the service on August 30th, 1862, with a disability rated one-half. The case is reported by Surgeon A. Hammer, U. S. V. Drs. E. H. Henry and J. N. Means, of Washington County, Illinois, report, October 29th, 1862, that a portion of the superciliary ridge was removed, and that the pensioner was unfit for manual labor or any employment that produced cerebral excitement.

CASE.—Private *A. McDonald*, of the Palmetto Sharpshooters, was admitted to the South Carolina Hospital, at Charlottesville, Virginia, on September 6th, 1862, with a gunshot wound of the head, received a few days prior to admission. The os frontis at the outer extremity of the left frontal sinus was fractured to a considerable extent. The outer wall of the sinus was removed; the inner table was uninjured. The case progressed favorably, and on November 11th, 1862, the patient was furloughed, being nearly well. The case is recorded by Assistant Surgeon B. W. Allen, P. A. C. S.

CASE.—Private Albert J. Miller, Co. B, 26th Illinois Infantry, aged 30, was wounded at Jonesboro', Georgia, August 31st, 1864, by a piece of shell which fractured and slightly depressed the outer table of the frontal bone above the left eye. He was, on September 5th, admitted to the field hospital of the Fifteenth Corps, and on September 20th he was furloughed. No record of the case can be found until December 3d, when he was admitted to the hospital at Jeffersonville, Indiana. He stated that several pieces of bone had come away. On December 5th he was sent to the hospital at Quincy, Illinois, and thence furloughed on December 24th, 1864. He was, on February, 1865, promoted to a lieutenancy in the 147th Illinois Volunteers, and was mustered out on January 20th, 1866. His name does not appear on the Pension List.

CASE.—Private John Miller, Co. I, 12th New Jersey Volunteers, aged 45 years, was wounded at the battle of the Wilderness, Virginia, May 6th, 1864, by a conoidal musket ball which fractured the external orbital process of the frontal bone. He was admitted to the hospital of the 2d division, Second Corps, and thence conveyed to the Mount Pleasant Hospital, Washington, where he was admitted on May 29th, 1864. Death resulted on the 22d of June.

CASE.—Private George Mills, Co. M, 8th Illinois Cavalry, aged 33 years, at Beverly Ford, Virginia, June 9th, 1863, was struck in the forehead by a carbine ball which, passing from left to right, fractured the outer table of the frontal bone over the left eye, near the external angle. He was conveyed to Washington and admitted into the Lincoln Hospital on the following day, suffering, from time to time, severe pain and vomiting. Ice water dressings were applied to the head, and a restricted diet ordered; anodynes being employed to relieve the pain. In a few days the severity of the pain subsided. He improved rapidly, and was returned to duty on August 6th, 1863. The case is reported by Acting Assistant Surgeon Wm. Canniff. In May, 1867, Pension Examining Surgeon J. B. Lyman reported, that this pensioner had a permanent enlargement of the pupil of the left eye, and immobility of the iris, and that he considered the functions of the retina permanently impaired.

CASE.—Private James Murphy, Co. K, 93th Pennsylvania Volunteers, was wounded at the battle of Spottsylvania, Virginia, May 12th, 1864, by a conoidal ball which entered behind the right temporal fossa, passed forward and fractured the outer table of the frontal bone at the supra orbital ridge. He was conveyed to Washington, D. C., and on May 18th admitted to Douglas Hospital. There was no depression, but the right pupil was widely dilated and vision impaired. No brain symptoms occurred at any time. Poultices were applied and portions of bone subsequently removed. The patient recovered, and on June 18th was sent to Haddington Hospital, and on July 23d, 1864, returned to duty. He is not a pensioner.

CASE.—Private Constantine O'Donnell, Co. G, 184th Pennsylvania Volunteers, aged 34 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, receiving a gunshot fracture of the external table of the frontal sinus. He was admitted to the 2d division, Second Corps, field hospital, and on the 7th was conveyed to the Carver Hospital at Washington. Several sequestra were removed, and simple dressings were applied. On the 11th he was transferred to the Haddington Hospital, Philadelphia, and on June 26th death supervened from compression of the brain.

CASE.—Private James B. Perkins, Co H, 20th Connecticut Volunteers, aged 23 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a musket ball which fractured the frontal bone an inch above the right eye and lodged in the frontal sinus. He was taken prisoner, but was paroled on May 10th, and admitted two days subsequently into the field hospital of the Twelfth Corps. He was transferred to Fairfax Seminary hospital on June 14th, and thence to Philadelphia on the 17th, and admitted into Mower Hospital. On the 28th an examination of the wound revealed the external table denuded and slightly depressed. On July 10th the wound was discharging healthy pus, and on August 5th had closed, except an opening half an inch wide. On November 23d he had sufficiently recovered to be placed on guard duty in the hospital. On December 8th a slight swelling over the right frontal protuberance was observed. The probe detected small loose fragments of bone. Acting Assistant Surgeon J. M. McGrath made a straight incision an inch in length, extending from the fistulous orifice over the superciliary ridge. The outer table of the skull was found destroyed, and a musket ball almost completely divided through its centre and spread open, was discovered partially imbedded in the frontal sinus. The missile, together with several fragments of bone, was removed by forceps. The wound was closed by adhesive strips, and cold water dressings were applied. The patient improved gradually, and by January 18th, 1864, the wound had healed except at a small opening through which there was a slight discharge of healthy pus. On March 31st he was transferred to New Haven to the Knight Hospital, whence he was returned to duty on May 7th, 1864. The case is reported by Surgeon Joseph Hopkinson, U. S. V. The name of this patient is not upon the rolls of the Pension Office.

CASE.—Private Henry R. Snap, Co. I, 18th Kentucky Volunteers, was wounded at the battle of Chickamauga, Georgia, September 19th, 1863, by a conoidal musket ball which penetrated the external table of the frontal bone at the left superciliary ridge and lodged in the frontal sinus. The missile was extracted, and the wound suitably dressed at the field hospital where the patient remained until November 27th, when he was sent to Lexington, Kentucky. He was returned to duty December 28th, but being found unfit for service was again admitted into a general hospital at Murfreesboro', Tennessee, January 23d, 1864. He now fully recovered and was returned to duty on March 14th, 1864. He is not reported as an applicant for pension.

CASE.—Private Orrin C. Spencer, Co. F, 11th Connecticut Volunteers, aged 18 years, was wounded at the battle of Antietam, Maryland, September 17th, 1862, by a musket ball which fractured the outer table of the frontal bone at its superior portion and to the left of the median line. He was stunned, but after reaction, endeavored to walk, but was too faint and giddy to go far. With the assistance of two comrades he retired to a field hospital where cold water was applied to the wound. He was transferred to Frederick, and thence to Washington, entering Capitol Hospital on the 22d. On the 24th he was sent to the DeCamp Hospital, David's Island, New York Harbor, where he arrived on the 28th. The wound was discharging freely. At the expiration of a week erysipelatous action set in, which was, however, readily combatted by a purge and the local application of iodine. On October 26th two pieces of the outer table of the frontal bone were removed. At times he suffered severe pain over his eyebrows which extended over the left side of his head, and occasionally he was so dizzy that he could not walk across the ward. He was discharged from the service on November 12th, 1862. The wound had healed, but dizziness occasionally recurred. On January 3d, 1868, the Commissioner of Pensions stated that Spencer was a pensioner, that his disability was rated at one-third, and the prognosis of its duration doubtful. Surgeon S. W. Gross, U. S. V., reports the early history of the case.

CASE.—Sergeant Paul P. Starke, Co. H, 95th Pennsylvania Volunteers, aged 21 years, received, at the battle of Spottsylvania Court-house, Virginia, May 12th, 1864, a gunshot fracture of the external table of the frontal bone, at the external edge of the left orbit. He was immediately admitted to the hospital of the 1st division, Sixth Corps, and on the 19th transferred to the Carver Hospital. Sequestra were removed from the wound and simple dressings applied. The patient recovered, was furloughed on May 27th, 1864, and returned to the hospital June 29th. He was pensioned, and on October 15th, 1866, Pension Examining Surgeon J. Cummiskey, reported his disability as one quarter, and its duration doubtful.

CASE.—Private Leonard H. Washburn, Co. E, 1st Maine Heavy Artillery, aged 21 years, was wounded at the battle of Spottsylvania Court House, Virginia, May 19th, 1864, by a conoidal ball which fractured the outer table of the frontal bone. He remained in the field hospital until May 24th, when he was conveyed to Washington and admitted to the Carver Hospital. On June 1st he was sent to the Mower Hospital, Philadelphia. The patient recovered and was returned to his regiment for duty December 27th, 1864. He served in the field until the middle of March, 1865, when he was again admitted to the field hospital and sent, on April 10th, to the Armory Square Hospital, with aphonia and partial amaurosis, the latter a consequence of the old wound. He was discharged on June 9th, 1865. On August 3d, 1869, Pension Examining Surgeon E. A. Thompson reports that this patient had a constant discharge of pus from the wound, and severe headache after exertion or exposure; that he was unable to perform any labor that requires exertion or mental effort, and that the severe pain affected his general health.

CASE.—Private Charles F. B———, Co. D, 101st Ohio Volunteers, received, at the battle of Murfreesboro', Tennessee, December 31st, 1862, a gunshot fracture of the outer table of the frontal bone over the right eye by a conoidal musket ball. He was treated at the hospital of the 1st division of the Fourteenth Corps until January 7th, 1863, when he was sent to hospital No. 14, at Nashville, whence he was discharged from service on April 26th, 1863, and pensioned. The pension examiner reports that the missile lodged in the frontal sinus whence it was extracted, and that the pensioner suffers from persistent pain in the head and vertigo with loss of sight, and that he is unable to perform any manual labor.

Next in frequency to the fractures of the outer plate of the frontal sinus, among the cases of gunshot fracture reported as limited to the external table, were those of the mastoidal region of the temporal. In nine cases, in which the injuries are described with precision, the mastoid process was detached or seriously fractured in seven, and the outer lamina of the contiguous portion of the temporal in two. One case was fatal. Five of

the patients were discharged or mustered out, and three of these were subsequently pensioned. Three recovered and were returned to duty. Permanent deafness in three cases, and troublesome caries in two, are reported in the cases of those who recovered.

CASE.—Private Albert Bradley, Co. E, 13th New Jersey Volunteers, was wounded at the battle of Antietam, September 17th, 1862, by a musket ball which chipped off a portion of the exterior lamina of the left temporal bone, and lodged behind the ramus of the lower jaw. On September 24th he was sent to the South Street Hospital, Philadelphia, and on the 26th the missile was extracted. In the course of the treatment the wound repeatedly reopened, but, ultimately, healed firmly, and the patient was returned to duty, December 22d, 1862. The case, thus far, was reported by Surgeon P. B. Goddard, U. S. V. The patient was discharged on May 26th, 1863, and pensioned. On June 10th, 1869, his pension was increased, Pension Examiner A. W. Woodhull having reported that he was entirely deaf in the left ear; that the cicatrix was constantly tender and painful; that he had severe attacks of headache and vertigo, induced by exposure to the sun or by changes of temperature.

CASE.—Corporal John C. B———, Co. K, 5th Maryland Volunteers, aged 33 years, was wounded at the battle of Antietam, Maryland, September 17th, 1862. The missile entered the posterior part of the neck, one and one-half inches below the occipital protuberance just forward of the ligamentum nuchæ, passed upward and forward, and emerged above the right ramus of the lower jaw. He was sent to Washington, and admitted to Columbian College hospital on September 20th. No fracture could be discovered. He complained of difficulty in mastication, and there was evidently some injury of the facial nerve. In a few days the wound began to suppurate, and the patient walked about the ward apparently doing well. October 8th, suppuration suddenly ceased. Chills occurred; the frequency of recurrence increased until October 12th, when there was heavy deep breathing, and many symptoms of meningitis. Drowsiness and stupor followed, and coma and death took place October 14th, 1862. At the autopsy it was found that the ball had detached the mastoid process, denuded the occipital and temporal bones of periosteum in the vicinity of the fracture. There was some redness and congestion of the blood vessels, but no traces of inflammation could be found in the brain itself. The specimen was sent to the Army Medical Museum by Surgeon A. Van Derveer, 66th New York Volunteers, and is represented in the adjacent wood-cut, (FIG. 46.) The process is entirely detached at the base, the mastoid cells are opened, of course, but there is no fissuring or other lesion of the inner table and no attempt at repair. Dr. Van Derveer's report does not refer to any impairment of the sense of hearing prior to the supervention of coma.*

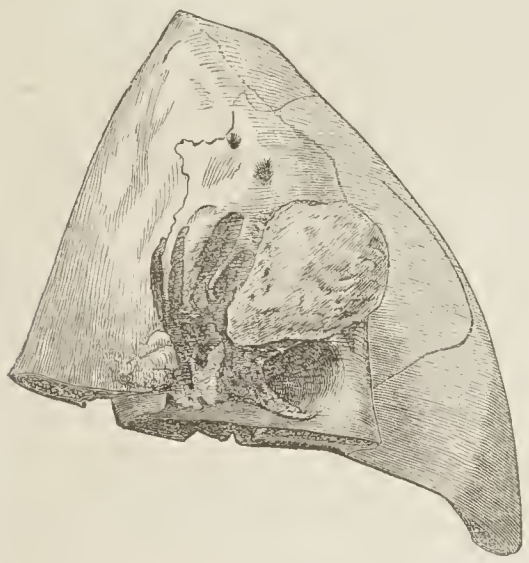

FIG. 46.—Segment of skull showing detachment of the mastoid process of the right temporal. *Spec.* 183, Sect. I, A. M. M.

CASE.—Private John Burke, Co. K, 9th Illinois Volunteers, was wounded at the battle of Corinth, Mississippi, October 3d, 1862, by a conoidal musket ball which perforated the middle portion of the left ear, and passing under the integuments, across the mastoid process, fractured the outer lamina of the bone. He was admitted to the hospital of the 2d division of the Army of the Tennessee, and on October 13th was sent to the hospital at Mound City, Illinois. Simple dressings only were employed. Burke was returned to duty on October 28th, 1862. His name is not upon the list of pensioners.

CASE.—Private William H. Bush, Co. F, 27th Massachusetts Volunteers, aged 26 years, was wounded before Petersburg, June 18th, 1864, by a piece of shell which contused the left temporal bone. He was, on the following day, admitted to the field hospital of the Eighteenth Corps. The injury was considered slight, and the man returned to his regiment for duty. No further record of the case can be found until January 27th, 1865, when he was admitted to the Foster Hospital, at New Berne, with ulceration of the scalp. He was again returned to duty on March 8th, 1865, but on March 31st was admitted to the DeCamp Hospital, at David's Island. On April 4th he was transferred to the Dale Hospital, Worcester, and now it was definitely ascertained that the right temporal bone was fractured, though no depression existed. The man was mustered out of service on June 17th, 1865. He afterwards made a claim for a pension, but withdrew it without awaiting a decision. The report to the Pension Office by Examining Surgeon J. H. Waterman, states that the patient had a fracture of the outer table of the left temporal, portions of which had been removed by caries. In October, 1865, the wound was healing and the disability was not considered permanent.

CASE.—Private Alexander J. Clark, Co. D, 63d Pennsylvania Volunteers, was wounded at Charles City Cross Roads on June 30th, 1862. The missile entered behind the left ear and injured the mastoid process of the temporal bone. He was admitted, on August 17th, to the hospital at Point Lookout, Maryland, and discharged from the service and pensioned on December 25th, 1862. The wound had healed with an irregular cicatrix, and the hearing was somewhat affected. He re-enlisted on February 8th, 1864, in Co. F, Pennsylvania Light Artillery, and was mustered out on June 26th, 1865. On July 31st, 1866, Pension Examiner G. McCook, of Pittsburg, reported that his hearing was affected, and there was a purulent discharge from the ear, and pain in its vicinity.

CASE.—Private Daniel Clymer, Co. B, 38th Ohio Volunteers, received, in an engagement near the Chattahoochie River, Georgia, July 20th, 1864, a gunshot partial fracture of the left mastoid process. He was admitted into the field hospital of the 3d division, Fourteenth Corps, and a few days later sent to the No. 2 hospital, Chattanooga, Tennessee. He was returned to duty September 20th, 1864. His name does not appear on the Pension List.

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* See *Catalogue of the Surgical Section* A. M. M., p. 11, and *Circular* No. 6, S. G. O., 1865, p. 12. The history of the specimen was procured subsequently to the date of those publications.

Case.—Lieutenant Joseph S. Heston, Co. D, 4th New Jersey Volunteers, was wounded at the battle of the Wilderness, Virginia, May 5th, 1864, by a buckshot which injured the mastoid process of the temporal bone. He was admitted to the hospital of the 1st division of the Sixth Corps, but returned to his regiment in a short time. He was mustered out with his regiment, June 9th, 1865. His name is not upon the Pension Rolls.

Case.—Private Henry Meixner, Co. F, 61st Pennsylvania Volunteers, aged 23 years, was wounded in the defences of Washington, D. C., on July 12th, 1864, by a conoidal ball which fractured the outer plate of the mastoid process of the temporal bone. He was, on the same day, admitted to the Mount Pleasant Hospital. The wound became gangrenous, and on July 30th hæmorrhage to the amount of ten ounces occurred from a branch of the occipital artery. On the following day hæmorrhage recurred, but was arrested by compression. On September 8th Meixner was furloughed, and on November 8th he was admitted to the hospital at Pittsburg, and on May 22d, 1865, discharged from the service. His name is not upon the Pension List.

Case.—Private Samuel N. Morse, Co. A, 74th Illinois Volunteers, aged 27 years, was wounded in an engagement at Kingston, Georgia, May 17th, 1864, by a conoidal musket ball which entered near the right ear, detaching a scale from the mastoid process of the right temporal bone, and passed through the cheek. He was, on the same day, admitted to the hospital of the 2d division, Fourth Corps, and thence sent to Chattanooga and Nashville, and to the Jefferson Hospital in Indiana. On July 26th he was sent to Camp Butler, Illinois; furloughed on September 2d, and on November 2d admitted to the hospital at Quincy, Illinois. He was finally discharged from service on the 29th of May, 1865. At this date, Pension Examiner J. Robbins reports that the patient was deaf in the right ear, and that his system was enfeebled by long continued suppuration.

In the four following cases, it was believed, after careful exploration, that the outer table alone of the parietal was fractured·

Case.—Private *O. G. Ayres*, Co. A, 22d Virginia Infantry, aged 24 years, received, at the action at Mine Run, Virginia, November 27th, 1863, a gunshot fracture of the outer table of the right parietal bone. He was admitted to the Chimborazo Hospital, Richmond, on November 30th. He had slight fever with coma, and the pulse was slow, leading to the supposition that both tables were fractured; but, on closer examination it was discovered that the outer table only was fractured to the extent of one and one-half inches. The bowels were well opened with calomel, gamboge, and castor oil, and the coma abated. Cold applications were constantly applied to the wound, and calomel was pushed to ptyalism. The patient became rational and the coma disappeared. On December 5th erysipelas developed itself over the head and face. The parts were painted with iodine and tincture of sesqui-chloride of iron was administered internally. On the 15th the patient had almost entirely recovered, and was furloughed on December 25th, 1863. He appeared before a medical examining board of General Heth's division, September 8th, 1864, and was retired on account of cerebral disturbance accompanied by convulsions.

Case.—Private George Atkinson, Co. F, 7th Wisconsin Volunteers, aged 24 years, was wounded at the battle of the Wilderness, Virginia, May 5th, 1864, by a conoidal musket ball which injured the outer table of the skull. He was sent to the hospital of the 4th division, Fifth Corps, thence on May 12th to the 2d division hospital at Alexandria, thence on the 22d to the Satterlee Hospital, Philadelphia, where the injury is reported as a wound of scalp. Having recovered, he was returned to duty on the 17th of September, 1864. He was discharged on July 3d, 1865, and pensioned. On November 12th, 1868, Pension Examiner G. W. Eastman reported that there then had been fracture of the outer table of both parietals, and that the patient complained of numbness of the extremities.

Case.—Assistant Surgeon Levi Jewett, 14th Connecticut Volunteers, aged 20 years, while attending upon the wounded at the battle of Ream's Station, Virginia, August 25th, 1864, was struck upon the left side of the head by a fragment of shell which fractured the outer table of the parietal bone, and the zygomatic process of the temporal, denuding the skull over an equilateral triangular surface of four inches a side. For a few days he was treated in the hospital of the Second Corps, then transferred to Washington, and on the 29th admitted into the Emory Hospital. So far as recorded cold water dressings formed the main treatment. On September 1st he was transferred to the Seminary Hospital in Georgetown, and thence on December 3d to the Officer's Hospital at Annapolis, Maryland. He remained under general treatment until January 6th, 1865, when he was discharged from service. He still complained of a fullness of the head and of imperfect vision of the left eye though there was no perceptible difference in the organs of vision. He was naturally short sighted. The general condition of the patient, however, was good. The case is reported by Acting Assistant Surgeon J. Longenecker. This officer has not applied for a pension.

Case.—Private *W. B. Taylor*, Co. G, 38th Alabama Infantry, received, at the battle of Dalton, Georgia, April 9th, 1864, a gunshot fracture of the external table of the right parietal bone. He was admitted into the hospital at Dalton on the same day. Exfoliation of the bone took place. On June 23d, 1864, he was furloughed.

Other cases of grooving of the outer plate and diploe are reported, in which the injury appears not to have implicated the inner table:

Case.—Private John Anderson, Co. A, 77th Illinois Volunteers, was wounded at the battle of Arkansas Post, January 11th, 1863, by a conoidal musket ball which struck at the junction of the frontal and left parietal bones, and passed backward near the sagittal suture almost as far as the lambdoidal, denuded the bone and grooved the outer table for a length of two and one half inches. He was carried on board the hospital steamer D. A. January, and conveyed to Memphis, Tennessee, where he was admitted, on the 23d, into Hospital No. 3. No fracture or depression was observed, but exfoliation shortly took place, and several pieces of the external table were removed. The inner table, also, was found to be necrosed, and a month after the reception of the injury a detached piece of the inner plate, three-fourths of an inch in diameter, was extracted, leaving the

pulsation of the brain clearly visible. Subsequently, other small portions of the external plate were removed as they became loose. The sight of the left eye, though not at first affected by the injury, became, in the course of two or three weeks, to use the expression of the patient, feeble and glimmering, so that, for instance, a printed page would appear blurred. He was discharged from service and pensioned on the 3d of April, 1863. The wound had not fully healed, but was gradually contracting; the vision remained impaired. The case is reported by Assistant Surgeon Thomas T. Smiley, U. S. V.* On October 1st, 1863, Pension Examiner H. S. Hurd reported that this man had partial loss of sight of the left eye. On August 6th, 1867, Pension Examiner G. W. Spalding reported that the ball penetrated the right parietal, "remaining some time in the brain, which sloughed considerably;" a statement so at variance with previous reports that it was probably derived from hearsay.

CASE.—Private John Boylan, Co. I, 1st Michigan Volunteers, aged 26 years, was wounded at the battle of Gaines's Mill, Virginia, June 27th, 1862, by a conoidal musket ball which struck the right parietal bone at its superior posterior angle, carried away a piece of the scalp larger than a half dollar, and grooved the bone for a distance of three-fourths of an inch. He was unconscious for nearly thirty minutes after the reception of the injury, was then taken prisoner, and conveyed to Richmond, where the wound was dressed for the first time, on June 30th, with cold water dressings. The left arm had become paralyzed and devoid of sensation, and continued so for about a week. He remained in Richmond about three weeks when he was exchanged and sent to the De Camp Hospital, David's Island, New York Harbor. The wound had cicatrized but slightly, and was discharging very offensive pus, and the bone was found to be necrosed. On July 28th a portion of the external table, and on the following day the corresponding portion of the diploe and vitreous table were removed, exposing the dura mater to the extent of an inch and a half. Cold water dressings were applied, and the patient recovered rapidly. At the time of his discharge, November 16th, 1862, the wound had healed perfectly, the cicatrix presenting a depression sufficiently large to receive the index finger. The parts were very tender, and pressure would produce a sensation of dizziness. Excepting a slight intermittent headache, no symptoms of brain complication occurred at any time. The pathological specimen was contributed to the Army Medical Museum, and consists of two exfoliations. The smaller, one inch in length, consists mainly of diploe; the other, which measures three-fourths of an inch by one and a half inches, is blackened and perforated in the centre. It is represented in the adjacent wood-cut, (FIG. 47.) The history was contributed by Surgeon S. W. Gross, U. S. V. Boylan's name is not upon the Pension List.

FIG. 47.—Exfoliation resulting from the grooving of the parietal bone by a musket ball. *Spec.* 974, Sect. 1, A. M. M.

CASE.—Private Noah Frey, Co. I, 54th Pennsylvania Volunteers, aged 22 years, received, at the battle of New Market, Virginia, May 15th, 1864, a gunshot wound of the right parietal region, about two and one-half inches above the ear, with partial fracture of the cranium. He was sent to the hospital at Cumberland, Maryland, on May 18th. There was a longitudinal superficial furrow about two inches in length running in an antero-posterior direction. Some fragments of bone came away in the progress of the case. Simple dressings were used. The wound gradually healed, and he was returned to duty October 26th, 1864. The case is reported by Surgeon J. B. Lewis, U. S. V. The name of the patient is not upon the Pension List.

CASE.—Private *J. M. Hardin*, Co. B, 27th North Carolina Infantry, received, at the battle of the Wilderness, Virginia, May 6th, 1864, a gunshot wound of the scalp in the line of the coronal suture, with loss of a portion of the outer table of the bone. He was admitted, on May 11th, into the hospital at Farmville, and he was furloughed June 3d, 1864.

CASE.—Private Thomas Mahoney, Co. E, 89th Illinois Volunteers, aged 23 years, was wounded in the engagement near Dallas, Georgia, May 27th, 1864, by a conoidal musket ball which struck the upper part of the right parietal bone, grooving it slightly. He was admitted to the hospital of the Fourth Corps on June 5th, and sent to No. 19, Nashville; on June 17th, to No. 5, New Albany; on June 27th, to Jefferson Barracks, St. Louis, Missouri; and on July 9th, 1864, to the hospital at Quincy, Illinois, whence he was returned to duty on August 23d, 1864. His name does not appear as an applicant for a pension.

CASE.—Private Wilkie Martin, Co. H, 6th Pennsylvania Cavalry, aged 25 years, was wounded at the battle of the Wilderness, Virginia, May 6th, 1864, by a conoidal musket ball which struck at the vertex, laid bare the scalp, and grooved the bone for a small distance. He was admitted into the field hospital of the Cavalry Corps on the following day, and on the 23d sent to the 3d division hospital, Alexandria. Simple dressings were used. On June 6th the patient was transferred to the Mower Hospital, Philadelphia, and on November 7th, 1864, he was discharged from the service. The case is reported by Surgeon Edwin Bentley, U. S. V. He is not a pensioner.

CASE.—Private John Michael, Co. E, 67th Pennsylvania Volunteers, was wounded at the battle of the Wilderness, Virginia, May 6th, 1864, by a conoidal ball which entered the scalp at the vertex and ploughed out a portion of the scalp about three inches in length and one inch in width, and grooved the outer table of the skull. He was admitted to the hospital of the 1st division of the Sixth Corps, and on May 11th was sent to the Columbian Hospital at Washington, and May 15th to the Patterson Park Hospital, Baltimore, and on May 21st to the hospital at York, Pennsylvania. On May 31st erysipelas appeared and extended rapidly over the forehead and left side of the face, and the parts around the eye became much swollen. Ice water, tincture of iodine, and acetate of lead to the eye, were employed. On June 3d the wound had healed and the patient was nearly well. He was returned to duty on September 29th, 1864. The case is reported by Surgeon Henry Palmer, U. S. V. The name of this patient does not appear upon the Pension List.

* See *Boston Medical and Surgical Journal*, vol. LXIX, p. 152, September, 1863.

CASE.—Private James W. Slater, Co. C, 49th Ohio Volunteers, aged 16 years, was wounded in an engagement at Lost Mountain, Tennessee, June 14th, 1864, by a fragment of shell which grooved the external table of the frontal bone. He was conveyed, on June 22d, to the Cumberland Hospital at Nashville, Tennessee, where he remained until the 9th of August, when he was transferred to the Joe Holt Hospital at Jeffersonville, Indiana. On November 26th, 1864, he was returned to duty, and discharged June 3d, 1865. He has a pension claim pending. Pension Examiner W. W. Cake reports, September 22d, 1866, that portions of the outer wall of the frontal above the right eye had been removed, and that the applicant suffered from cerebral disorder on exposure, and that his disability might be rated at two-thirds and permanent.

CASE.—Corporal Hendrick J. Smith, Co. E, 137th New York Volunteers, aged 21 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a fragment of shell which fractured the central portion of the right parietal bone, apparently grooving the outer table only. He was partially insensible for the first three days after the reception of the injury, and remained upon the field for eleven days. When admitted to the hospital of the Twelfth Corps, May 14th, 1863, he was greatly exhausted from privation and exposure, and his countenance presented a wild and excited appearance. Cold applications were applied to the wound, the bowels freely opened and generous diet ordered. On May 20th the wound was closing and the patient had much improved, looking well, except the same wild expression; he talked rationally but the memory was lost. He was returned to duty on June 1st, 1863. He is not reported as an applicant for a pension.

CASE.—Private L. V. Stewart, Co. A, 20th Massachusetts Volunteers, aged 35 years, was wounded at the battle of Gettysburg, Pennsylvania, July 1st, 1863, by a fragment of shell which fractured the outer table of the parietal bone one inch above the right ear. In the same engagement he received a wound of the back. He was treated at the Seminary Hospital until the 16th of July, and then sent to the McKim Mansion Hospital, Baltimore, at which time he was suffering considerable pain in the head, left eye, and face. On the 25th paralysis of the right side of the face supervened by which the mouth was drawn to the left side. In connection with local applications, acetate of opium in camphor water was employed by which the degree of pain was lessened, though the paralysis continued the same. On November 8th he was furloughed, and on the 30th transferred to the Jarvis Hospital. He recovered and was transferred to the Veteran Reserve Corps, March 21st, 1864. Acting Assistant Surgeon R. H. Sterling reports the case. The name of the patient does not appear on the Pension Rolls.

CASE.—Private Frederick Strouse, Co. I, 26th Michigan Volunteers, aged 31 years, received, in the engagement at Deep Bottom, Virginia, August 16th, 1864, a gunshot scalp wound at the vertex with fracture of the outer table of the cranium. He was taken prisoner, but subsequently paroled and admitted into the hospital at Camp Parole, Annapolis, on September 22d. On February 21st, he was admitted to the Harper Hospital, Detroit, Michigan, and on June 7th, 1865, discharged from service. Acting Assistant Surgeon W. H. Chandler certifies, on the certificate of disability, that there was a gunshot wound of the crown of the head fracturing the outer table of the skull.

CASE.—Private William H. Voss, Co, G, 5th Delaware Volunteers, aged 35 years, was wounded in the engagement at the South Side Railroad, Virginia, April 1st, 1865, by a fragment of shell which cut the scalp and furrowed the occipital protuberance. He was admitted to the hospital of the 2d division of the Fifth Corps, and on April 7th was sent to the Finley Hospital, Washington. He was returned to duty on July 8th, 1865. He does not appear to have been an applicant for a pension.

CASE.—Private Jacob Welsh, Co. A, 107th Pennsylvania Volunteers, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a fragment of shell which fractured the external table of the right parietal, the bone being driven upon the diploeic structure. He was conveyed to the hospital at York, Pennsylvania, on July 12th. No ill result ensued from the injury. On October 1st small portions of bone were removed. Having recovered, he was returned to duty on November 16th, 1863. The case is reported by Acting Assistant Surgeon H. L. Smyser. The name of the patient is not upon the Pension List.

CASE.—Private George L. Wood, Co. I, 5th New York Volunteers, was wounded at the battle of Gaines's Mill, June 27th, 1862, by a conoidal musket ball which struck the back of the head obliquely, making a long scalp wound and grooving the outer table of the occipital bone. He was treated at Ira Harris Hospital, Albany, New York, and discharged from service on December 15th, 1862, and pensioned. Pension Examiner S. D. Willard reports, June 18th, 1863, that this pensioner was much disabled, but likely to recover in the course of a few years.

Four instances are reported of fracture of the external lamina of the occipital near its protuberance or semicircular ridges:

CASE.—Private *C. J. Adams*, Co. H, 21st North Carolina Regiment, aged 19 years, was wounded at the battle of Winchester, Virginia, September 19th, 1864, by a conoidal ball which fractured the outer table of the occipital bone. Fragments of the bone were removed at the hospital of the Nineteenth Corps at Winchester where he remained until the 20th of November, when he was conveyed to Martinsburg, and thence sent to Baltimore, Maryland, entering West's Buildings Hospital on December 11th. On January 8th, 1865, he was sent to the Prisoner's Camp, Point Lookout, but on the 27th was admitted to the hospital at the latter place, suffering from the effects of the wound. Death from apoplexy supervened April 15th, 1865.

CASE.—Private Charles D. Fairbanks, Co. E, 2d United States Sharpshooters, aged 18 years, was wounded in front of Petersburg, Virginia, November 20th, 1864, by a conoidal ball which fractured the external table of the occipital bone. He was conveyed to a field hospital, and on December 4th was admitted to Armory Square Hospital. Simple dressings were applied to the wound until April 1st, 1865, when a piece of the outer table, an inch square, was removed. The patient was returned to duty April 22d, 1865, suffering no disturbance of his cerebral functions from the injury. His name is not upon the Pension List.

CASE.—Private A. McDonald, Co. E, 42d Illinois Volunteers, aged 28 years, was wounded at the battle of Resaca, Georgia, May 14th, 1864, by a round musket ball which fractured the external table of the occipital bone near the junction of the lambdoidal and sagittal sutures. He also received, in the same engagement, a fracture of the spinous proces of the third lumbar vertebra, the ball lodging, and being cut out from the muscles on the left of the spine. He was admitted, on the following day, into the hospital at Chattanooga, Tennessee, and on the 17th sent to the Cumberland Hospital at Nashville, where he remained until transferred on the 10th of July to Jefferson Barracks in Missouri. He was subsequently sent to Keokuk Hospital in Iowa, where he arrived on July 28th, 1864. He was finally sent to Springfield, Illinois, on August 22d, and mustered out of service October 3d, 1864. From the report of Pension Examining Surgeon T. A. Henning, dated November 4th, 1864, information is obtained that the patient then suffered from vertigo and defective vision, and that these were increased by any exposure to the heat of the sun. The fracture of the spinous process of the vertebra produced an irritation at the neck of the bladder and weakness in the back. There had also been a flesh wound of the lower part of the right leg which had sloughed and left a painful cicatrix near the ankle. The pension examiner regarded the disabilities of this pensioner as total, but likely to diminish in a few years.

CASE.—Private George Statwood, Co. K, 4th New Hampshire Volunteers, aged 21 years, was wounded at the battle of Cold Harbor, Virginia, June 4th, 1864, by a conoidal ball which fractured the outer table of the occipital protuberance. He was at once admitted to the hospital of the Eighteenth Corps, thence sent to the Harewood Hospital, Washington, D. C., and on June 16th transferred to the Knight Hospital, New Haven, Connecticut. On July 18th he was sent to the Ward Hospital, Newark, New Jersey. On January 18th, 1865, denuded and carious bone was discovered through a large gangrenous opening in the scalp. The patient was placed under the influence of chloroform and ether, and Acting Assistant Surgeon W. S. Ward, removed the carious bone. Simple dressings were applied and the wound healed rapidly. Statwood was discharged from the service on the 29th of May, 1865, by reason of disability resulting from the wound. He does not appear to have made application for a pension.

Many cases appear on the reports as gunshot fractures of the external table of the skull, in which the appearances and symptoms are not defined with sufficient precision to permit a satisfactory judgment as to the accuracy of the diagnosis. Of these, twenty are alleged examples of gunshot fracture of the outer plate of the frontal bone. One was a fatal case, and the diagnosis was probably verified after death. Two were cases of Confederate soldiers, who recovered and were furloughed, and unaccounted for subsequently. One patient deserted. The remaining sixteen cases were of Union soldiers, of whom nine were returned to duty, one to modified duty in the Veteran Reserve Corps, and six were discharged for disability. The Veteran Reserve soldier and one of the discharged men are on the Pension Roll. The fractures are reported to have been inflicted by conoidal musket balls in eleven instances, by round musket balls in two, and by shell fragments in two, while in five cases the nature of the missile was unknown:

CASE.—Sergeant Major *L. M. Andrews*, 8th Georgia Regiment, was, on June 3d, 1864, admitted to the Confederate hospital at Farmville, Virginia, with a gunshot fracture of the external table of the frontal bone. He was very much debilitated from dysentery of three weeks standing, but he gradually improved, and was, on June 17th, 1864, furloughed for forty days.

CASE.—Corporal Francis Atwood, Co. B, 48th New York Volunteers, aged 30 years. Fort Wagner, South Carolina, July 18th, 1863. Round musket ball. Treated at Beaufort, McDougal, and DeCamp hospitals. Discharged from service August 25th, 1864. Not on Pension List.

CASE.—Corporal Hudson Austin, Co. G, 12th Connecticut Volunteers, aged 23 years. Cedar Creek, Virginia, October 19th, 1864. Conoidal musket ball. Treated at Jarvis and Mower hospitals. Returned to duty January 25th, 1865. Not on Pension List.

CASE.—Sergeant Benjamin F. Ball, Co. K, 127th Illinois Volunteers, aged 25 years. Atlanta, Georgia, August 25th, 1864. Conoidal musket ball. Treated at field, corps, and Nashville hospitals. Returned to duty November 21st, 1864. Not on Pension List.

CASE.—Private Nelson W. Chase, Co. A, 6th Vermont Volunteers, aged 21 years. Cold Harbor, Virginia, June 7, 1864. Treated at corps, Carver, and Brattleboro' hospitals. Returned to duty August 30th, 1864. Not on Pension List.

CASE.—Captain James Cross, Co. A. 99th Pennsylvania Volunteers. Fredericksburg, Virginia, December 13th, 1862. Treated at Officers' Hospital, Washington. Discharged from service January 14th, 1864. Not on Pension List.

CASE.—Private Charles Dickel, Co. D, 72d Pennsylvania Volunteers. Fredericksburg, Virginia, December 13th, 1862. Treated at Carver Hospital, Washington. Discharged from service February 16th, 1863. Not on Pension List.

CASE.—Private Martin Everett, Co. B, 124th New York Volunteers, aged 37 years. Spottsylvania Court-house, May 10th, 1864. Conoidal musket ball. Treated at corps, Alexandria, Mower, and DeCamp hospitals. Discharged from service October 3d, 1864. Not on Pension List.

CASE.—Private G. Gerbaner, Co. F, 19th Wisconsin Volunteers, aged 52 years. Petersburg, Virginia, June 16th, 1864. Conoidal musket ball. Treated at Hampton and Mower hospitals. Deserted January 6th, 1865. Not on Pension List.

CASE.—Sergeant George A. Keeler, Co. A, 20th Connecticut Volunteers. Fredericksburg, Virginia, May 3d, 1863. Fragment of shell. Treated at corps, Carver, and Knight hospitals. Returned to duty December 9th, 1863.

CASE.—Private *J. E. Key*, Co. C, 1st South Carolina Regiment. September 30th, 1864. Treated at Jackson Hospital, Richmond. Furloughed.

CASE.—Private James L. McMahan, Co. F, 87th Indiana Volunteers, aged 20 years. Chickamauga, Georgia, September 19th, 1863. Conoidal musket ball. Treated in hospitals at Nashville. Returned to duty April 18th, 1864. Not on Pension List.

CASE.—Corporal George Metzger, Co. I, 125th New York Volunteers, aged 18 years. Gettysburg, July 3d, 1863. Shell fragment. Treated at field and Newark hospitals. Transferred to Second Battalion Veteran Reserve Corps, February 4th, 1864. Discharged June 29th, 1865, and pensioned. Pension Examiner W. S. Searle, Troy, New York, reports that there is a depression over the left orbit, headache and giddiness, and rates the disability of the pensioner at "two thirds and permanent."

CASE.—Corporal S. H. Polley, Co. H, 4th New York Heavy Artillery, aged 21 years. Petersburg, Virginia, June 23d, 1864. Conoidal musket ball. Treated at Harewood and Rochester hospitals. Discharged July 7th, 1865. Pensioned. Pension Examiner Eli F. Hendrich reports, March 25th, 1867, that there was an exfoliation from the right side of the frontal bone, that the vision of the right eye was impaired, and that dizziness and headache was caused by slight exposure or exertion.

CASE.—Private John L. Pounds, Co. E, 100th Pennsylvania Volunteers, aged 20 years. Spottsylvania, Virginia, May 12th, 1864. Conoidal musket ball. Treated at corps, Harewood, Chester, and Pittsburg hospitals. Returned to duty October 3d, 1864. Not on Pension List.

CASE.—Colonel Richard Rowett, 7th Illinois Volunteers, aged 35 years. Allatoona, Georgia, October 5th, 1864. Conoidal musket ball. Treated at corps field hospital and Officers' Hospital at Nashville. Returned to duty and mustered out July 9th, 1865. Not on Pension List.

CASE.—Corporal Dwight C. Rose, Co. C, 11th Maine Volunteers, aged 34 years. Deep Run, Virginia, August 16th, 1864. Conoidal musket ball. Treated at Fort Monroe, DeCamp, and Webster hospitals. Returned to duty January 2d, 1865. Not on Pension List.

CASE.—Private James Smith, Co. C, 5th New Hampshire Volunteers, aged 22 years. Cold Harbor, Virginia, June 1st, 1864. Buck shot. Treated at Alexandria and Chester hospitals. Returned to duty July 8th, 1864. Not on Pension List

CASE.—Private James M. Thompson, Co. A, 70th Ohio Volunteers, aged 24 years. Atlanta, Georgia, July 28th, 1864. Conoidal musket ball. Treated at corps, Fairfax Seminary, and Camp Dennison hospitals. Discharged from service July 9th, 1855. Not on Pension List.

CASE.—Private Daniel Well, Co. A, 31st Indiana Volunteers, aged 19 years. Buzzard's Roost, Georgia, May 11th, 1864. Conoidal musket ball. Treated at Chattanooga, Cumberland, and Jeffersonville hospitals. Died June 27th, 1864.

Of seven alleged cases of fracture of the outer table of the temporal bone, reported without sufficient details to remove all doubt of the accuracy of the diagnosis, four occurred to Union and three to Confederate soldiers. All of the patients recovered. Of the three Confederates, two were furloughed and one was exchanged. Of the Union soldiers, three went to duty, one of them subsequently died a prisoner, and one deserted. Four were wounded by musket balls, one by a fragment of shell, and in two instances the nature of the missile is not stated:

CASE.—Corporal John Birdsill, Co. I, 101st Illinois Volunteers, Resaca, Georgia, May 15th, 1864. Right temporal, by conoidal musket ball. Treated at corps, Cumberland, Brown, and Quincy hospitals. Returned to duty January 27th, 1865. Not on Pension List.

CASE.—Private Jacob Boyer, Co. E, 11th Pennsylvania Volunteers, aged 33 years, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862. The missile entered just in front and above the external meatus, passed a little upward and inward, and then glanced downward to the mastoid portion of temporal bone, fracturing in its course the external table, and lodging over the mastoid process. He was admitted to the hospital of the 2d division, First Corps, and on December 18th was sent to Harewood Hospital, Washington, where, in January, 1863, a conoidal musket ball was removed through an incision. On January 20th the wound had nearly healed, and on May 6th, 1863, the patient was returned to duty. This soldier was subsequently made a prisoner, and according to the certificate of Assistant Adjutant General S. Breck, died at Salisbury, North Carolina, January 31st, 1865, the cause of death not being stated. In the application for pension by the widow it is stated that he died "by reason of scurvy and diarrhœa."

CASE.—Private *D. W. Delridge*, Co. G, 11th Mississippi Regiment. Gunshot fracture of outer table of right temporal. Treated at Howard Grove Hospital, Richmond, in August, 1864. Furloughed.

CASE.—Private *A. Easley*, Co. I, 32d Virginia Regiment. Gunshot fracture of outer table of temporal bone. Treated at Chimborazo Hospital, Richmond. Furloughed July 14th, 1864.

CASE.—Private Louis Fredenburger, Co. D, 55th New York Volunteers. Fair Oaks, Virginia, May 31st, 1862. Left temporal, by a fragment of shell. Treated at field and McKim's hospitals. Deserted August 13th, 1862. Not on Pension List.

CASE.—Private *John S. Haley*, Co. I, 3d North Carolina Regiment, aged 20 years, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal ball which fractured the external table of the temporal bone just above the right ear. He was admitted into the Seminary hospital, and the wound properly dressed. No head symptoms followed the injury. By the 4th of October the wound had entirely healed, and the patient was transferred to the general hospital at Point Lookout, Maryland. On March 3d, 1864, he was exchanged, being at that time in excellent health. The case is reported by Acting Assistant Surgeon R. N. Wright.

CASE.—Private William Schueble, Co. E, 32d Indiana Volunteers. Chickamauga, Georgia, September 19th, 1863. Conoidal musket ball. Treated at Chattanooga, Stevenson, New Albany, and Evansville hospitals. Returned to duty March 4th, 1864. Not on Pension List.

In twenty-five alleged fractures of the external table of the parietals, in twelve instances, the patients returned to duty after from four to six months' hospital treatment; three patients were exchanged, one deserted, eight were discharged for disability and four of this class are now on the Pension List, and one case terminated fatally. Twenty-one were Union and four were Confederate soldiers. In fifteen cases the injury was inflicted by conoidal musket balls, in three by shell fragments, in one by a grape shot, and in six instances the nature of the missile is not mentioned:

CASE.—Private *William T. Atkins*, Co. K, 3d Alabama Regiment, aged 21 years. Chancellorsville, May 3d, 1863. Conoidal musket ball. Treated at Lincoln Hospital. Exchanged and treated at Farmville Hospital. Retired August 12th, 1864.

CASE.—Private Smith Bailey, Co. E, 9th United States Colored Troops, aged 22 years. Deep Bottom, Virginia, September 29th, 1864. Conoidal musket ball. Treated at corps and Fort Monroe hospitals. Returned to duty March 13th, 1865. Not on Pension List.

CASE.—Sergeant *John T. Bane*, Co. C, 23d Virginia Battalion. Winchester, Virginia, September 19th, 1864. Conoidal musket ball. Treated at field and West's building hospitals. Exchanged October 25th, 1864.

CASE.—Corporal Thomas Beisty, Co. A, 43d New York Volunteers, aged 22 years. Wilderness, Virginia, May 5th, 1864. Conoidal musket ball. Treated at corps, Mount Pleasant, Jarvis, and Ira Harris hospitals. Returned to duty October 13th, 1864. Not on Pension List.

CASE.—Corporal Francis Bessell, Co. L, 25th New York Cavalry, aged 29 years. Middletown, Virginia, November 12th 1864. Conoidal musket ball. Treated at corps and Mower hospitals. Deserted May 26th, 1865. Not on Pension List.

CASE.—Private Richard Donovan, Co. G, 7th Rhode Island Volunteers, aged 28 years. Fort Sedgwick near Petersburg, April 2d, 1865. Conoidal musket ball. Treated at field, Mount Pleasant, and Lovell hospitals. Discharged June 29th, 1865. Not on Pension List.

CASE.—Private Edward Doyle, Co. D, 19th Massachusetts Volunteers, aged 26 years. Antietam, Maryland, September 17th, 1862. Treated at regimental and Annapolis hospitals. Discharged from service April 14th, 1864. Not on Pension List.

CASE.—Private William H. Elder, Co. B, 1st Pennsylvania Cavalry, aged 23 years. White House, Virginia, June 21st, 1864. Conoidal musket ball. Treated at Carver, Cuyler, and Mower hospitals. Discharged June 3d, 1865. Pensioned at six dollars per month.

CASE.—Private *A. Harris*, Co. A, 12th Alabama Regiment. Gunshot fracture of external table of parietals at the vertex. Treated at Howard Grove Hospital, Richmond. Furloughed May 26th, 1864.

CASE.—Corporal Ansell Hartwell, Co. I, 6th Missouri Volunteers, aged 25 years. Fort McAllister, Georgia, December 13th, 1866. Conoidal musket ball. Treated at corps, and Hilton Head hospitals. Returned to duty March 1st, 1865. Not on Pension List.

CASE.—Bugler Amos D. Hitchcock, Co. M, 3d Michigan Cavalry. Holly Springs, Mississippi, December 20th, 1862. Treated at Keokuk hospital, Iowa. Transferred to Veteran Reserve Corps December 11th, 1863. Pensioned, but died of pneumonia early in 1865.

CASE.—Lieutenant Albert Ivers, Co. C, 82d Pennsylvania Volunteers. Cold Harbor, Virginia, June 1st, 1864. Treated at corps and Washington hospitals. Returned to duty. Not on Pension List.

CASE.—Private Benjamin Jerrough, Co. G, 2d Vermont Volunteers, aged 34 years. Cold Harbor, June 3d, 1864. Conoidal musket ball. Treated at Lincoln and York hospitals. Returned to duty July 27th, 1864. Not on Pension List.

CASE.—Sergeant James Kay, Co. C, 83d Indiana Volunteers. Gunshot fracture of outer table of the vault of the cranium. Jonesboro', Georgia, August 30th, 1864. Treated at field hospital, where he died on August 31st, 1864.

CASE.—Private James McCarty, Co. F, 105th Pennsylvania Volunteers, aged 37 years. Petersburg, Virginia, April 2d, 1865. Fragment of shell. Treated at corps and Carver hospitals. Mustered out of service July 11th, 1865. Not on Pension List.

CASE.—Sergeant Daniel McDougall, Co. E, 17th New York Volunteers, aged 26 years. Jonesboro , Georgia, September 1st, 1864. Fragment of shell. Treated at corps, Atlanta, and Nashville hospitals. Returned to duty November 29th, 1864. Not on Pension List.

CASE.—Captain David McGauhey, 5th Pennsylvania Reserves. Spottsylvania, May 9th, 1864. Treated at corps and Officers' hospitals, Washington. Mustered out of service July 13th, 1864. Not on Pension List.

CASE.—Private Thomas Maley, Co. F, 7th Missouri Volunteers, Vicksburg, Mississippi, May 12th, 1863. Conoidal musket ball. Treated at field and Lawson hospitals. Transferred to the Veteran Reserve Corps December 10th, 1863. Not on Pension List.

CASE.—Private *E. F. Maples*, Co. G, 12th Alabama Regiment, aged 21 years. Winchester, Virginia, September 19th, 1864. Conoidal musket ball. Treated at Winchester, West's building, and Point Lookout hospitals. Sent to Provost Marshal for exchange February 11th, 1865.

CASE.—Corporal David Phillips, Co. D, 149th Pennsylvania Volunteers, aged 20 years. Spottsylvania, Virginia, May 8th, 1864. Conoidal musket ball. Treated at Douglas and Pittsburg hospitals. Returned to duty September 23d, 1864. Not on Pension List.

CASE.—Adjutant John S. Riehl, 26th Pennsylvania Volunteers, aged 34 years. Mine Run, Virginia, November 27th, 1863. Fragment of shell. Treated at Wolfe street, Alexandria, and Officers', Philadelphia, hospitals. Returned to duty March 4th, 1864. Not on Pension List.

CASE.—Sergeant George Roll, Co. A, 122d Ohio Volunteers, aged 25 years. Petersburg, Virginia, March 25th, 1865. Conoidal musket ball. Treated at corps, Lincoln, and Satterlee hospitals. Mustered out of service May 31st, 1865. Not on Pension List.

CASE.—Private Charles W. Rutherford, Co. B, 60th Illinois Volunteers, aged 25 years. Jonesboro', Georgia, September 1st, 1864. Grape shot. Treated at corps, Nashville, and Louisville hospitals. Returned to duty December 27th, 1864. Not a pensioner.

CASE.—Private Henry Sheets, Co. H, 13th Pennsylvania Cavalry, aged 20 years. Deep Bottom, Virginia, August 13th, 1864. Conoidal musket ball. Treated at corps, Emory, and South street hospitals. Discharged from service May 26th, 1865. Pensioned at four dollars per month.

CASE.—Corporal G. B. Smith, Co. B, 2d United States Sharp-shooters, aged 32 years. Spottsylvania, Virginia, May 16th, 1864. Conoidal musket ball. Treated at Carver and Mower hospitals. Transferred to Veteran Reserve corps January 24th, 1865. Pensioned at eight dollars per month.

Sixteen alleged fractures of the outer table were of the occipital region, eleven of the patients were Union and five were Confederate soldiers, of whom five returned to duty, five were discharged, and three died. One was exchanged, one furloughed, and in one case the ultimate result is not reported. The nature of the projectile is reported in eleven cases: musket balls in seven, pistol ball in one, and shell fragments in three:

CASE.—Private S. A. Carlin, Co. A, 70th New York Volunteers. Gettysburg, July 3d, 1863. Treated at corps and Seminary hospitals. Died July 21st, 1863.

CASE.—Corporal David A. Chandler, Co. B, 126th Ohio Volunteers, aged 22 years. Spottsylvania, Virginia, May 12th, 1864. Conoidal musket ball. Treated at corps, Emory, Summit House, Satterlee, Camp Chase, and Tripler hospitals. Transferred to Veteran Reserve Corps March 15th, 1865. Not on Pension List.

CASE.—Private Henry C. Cross, Co. G, 24th New York Volunteers, aged 18 years, was wounded, at the second battle of Bull Run, August 29th, 1862, by a fragment of shell which fractured the external table over the occipital protuberance. The wound in the scalp was nearly two inches long. He was conveyed to Washington, and on September 1st was admitted into the Unitarian Church hospital. Slight paralysis of the left arm and leg existed, and the wound was painful. Cold water dressings were applied, an ounce of sulphate of magnesia was administered and a restricted diet ordered. The patient was more or less delirious for two days. On September 30th he had so far recovered as to be able to walk about the ward, and the wound had nearly healed. He experienced no inconvenience from the injury except on exposure to the sun. The case is reported by Surgeon A. Wynkoop, U. S. V. The patient was discharged October 2d, 1862, and pensioned. Pension Examining Surgeon C. R. Clark reports, on February 3d, 1863, that this was a "fracture of the skull, carrying away a portion of its substance." The wound was nearly healed, and the patient suffered from throbbing pain and giddiness on active exertion. His disability was rated as total, but probably temporary.

CASE.—Private Riley A. Davidson, Co. F, 1st Vermont Volunteers, aged 30 years. Cedar Creek, Virginia, October 19th, 1864. Conoidal musket ball. Treated at corps, Satterlee, and Brattleboro' hospitals. Returned to duty December 13th, 1864. Not on Pension List.

CASE.—Private C. F. Dervey, Co. H, 1st New Jersey Cavalry, aged 24 years. Amelia Springs, Virginia, April 5th, 1865. Pistol ball. Treated at field, Annapolis, West's building, and York hospitals. Mustered out of service June 19th, 1865. Not on Pension List.

CASE.—Sergeant Alexander Hayes, Co. I, 84th Indiana Volunteers, aged 32 years. Knoxville, Tennessee, December 17th, 1864. Conoidal musket ball. Treated at Nashville, Jeffersonville, and Indianapolis hospitals. Discharged from service May 13th, 1865. Not on Pension List.

CASE.—Private *Joseph Marks*, 14th North Carolina Regiment, aged 40 years. Fort Fisher, North Carolina, January 7th, 1865. Treated at Point Lookout hospital. Died April 5th, 1865.

CASE.—Private John C. Martin, Co. E, 3d New Jersey Volunteers, received, at the battle of Gettysburg, July 3d, 1863, a gunshot fracture of the outer table of the occipital bone. He was treated at regimental, corps, and general hospitals, and was discharged from service on June 23d, 1864, and pensioned at four dollars per month. Pension Examiner F. F. Burmeister reports, March 2d, 1866, that this pensioner suffers from constant pain, and partial loss of memory, and rates his disability at one-half and permanent.

CASE.—Private W. H. Parmar, Co. A, 23d Ohio Volunteers, aged 43 years. Cedar Creek, Virginia, October 13th, 1864. Fragment of shell. Treated at Sheridan and Cumberland hospitals. Returned to duty November 28th, 1864. Not on Pension List.

CASE.—Private *W. A. Potts*, Co. K, 53d Georgia Regiment. Gunshot fracture of outer table of occipital. Treated at Howard Grove hospital, Richmond. Transferred to Macon, June 4th, 1864.

CASE.—Private George Prior, Co. K, 83d United States Colored Troops, aged 29 years. February, 1865. Conoidal musket ball. Treated at St. John's Hospital, Little Rock, Arkansas. Returned to duty September 26th, 1865. Not on Pension List.

CASE.—Private George W. Reed, Co. H, 12th Ohio Volunteers, was wounded near Laurel Creek, West Virginia, November 12th, 1861. One ball passed through the scalp at the back of the head and lodged in the diploic structure of the occipital, not perforating the bone; another struck on the outside of the left foot, about an inch below the external malleolus, passed forward and made its exit about two inches from point of entrance. He was admitted to the hospital at Gauley, West Virginia, and was doing well when seen by Surgeon G. G. Shumard, U. S. V., who reports the case. Reed was discharged from the service on December 28th, 1862. His name is not upon the Pension Rolls.

CASE.—Sergeant *H. C. Rinalder*, Co. K, 5th Alabama Regiment, aged 26 years. Cedar Creek, Virginia, October 19th, 1864. Conoidal musket ball. Treated at West's building and Point Lookout hospitals. Sent to Provost Marshal for exchange April 8th, 1865.

CASE.—Private *J. W. B. Robinson*, Co. G, 1st Virginia Cavalry. Spottsylvania, May 7th, 1864. Fragment of shell. Treated at hospital at Farmville, Virginia. Furloughed August 9th, 1864.

CASE.—Private David Simpson, Co. A, 1st North Carolina Volunteers, aged 35 years. Olustee, Florida, February 20th, 1864. Conoidal musket ball. Treated at Beaufort hospital. Returned to duty March 24th, 1864. Not on Pension List.

CASE.—Private *A. Young*, Co. C, 31st Virginia Regiment. Gunshot fracture of external table of the occipital. Treated at hospital at Farmville, Virginia. Died June 13th, 1864.

Twenty alleged cases of fracture of the external table of the skull are reported, without defining the location of the injury, as follows:

CASE.—Corporal *W. T. Bird*, Co. B, 11th Alabama Regiment. Gunshot fracture of external table of the skull. Treated at Howard Grove Hospital, Richmond. Furloughed May 13th, 1864.

CASE.—Private Napoleon Bombard, Co. K, 11th Vermont Volunteers, aged 21 years. Cedar Creek, Virginia, October 19th, 1864. Fragment of shell. Treated at corps, Filbert street, and Baxter hospitals. Returned to duty January 6th, 1865. Not on Pension List.

CASE.—Lieutenant Charles H. Briggs, Co. A, 1st Connecticut Cavalry. Hanover Court-house, Virginia, June 1st, 1864 Treated at corps and Officers' hospitals. Discharged January 20th, 1860. Not on Pension List.

CASE.—Corporal A. P. Cook, Co. H, 37th Massachusetts Volunteers, aged 22 years. Cold Harbor, Virginia, June 3d, 1864. Conoidal musket ball. Treated at corps, Alexandria, and Satterlee hospitals. Returned to duty September 17th, 1864. Not on Pension List.

CASE.—Private Hugh H. Cormack, Co. H, 27th Iowa Volunteers, aged 18 years. Nashville, Tennessee, December 16th, 1864. Conoidal musket ball. Treated at Cumberland and Jeffersonville hospitals, and returned to duty February 25th, 1865. His name does not appear on the list of pensioners.

CASE.—Lieutenant *R. F. Felder*, Co. I, 25th South Carolina Cavalry. Gunshot fracture of outer table of the skull, June 18th, 1864. Treated at No. 4 hospital, Richmond. Furloughed July 14th, 1864.

CASE.—Private Theodore Kestler, Co, F, 17th Ohio Volunteers, aged 18 years. Chickamauga, Georgia, September 20th, 1863. Conoidal musket ball. Treated at corps, Stevenson, and Nashville hospitals. Returned to duty February 5th, 1864. Not on Pension List.

CASE.—Private *A. B. McLain*, Co. M, 12th South Carolina Regiment. Gunshot fracture of outer table of the skull. Treated at Jackson Hospital, Richmond. Furloughed September 24th, 1864.

CASE.—Private Charles V. Marsh, Co. C, 15th Massachusetts Volunteers, aged 28 years. Gettysburg July 3d, 1863. Treated at corps and Mower hospitals. Returned to duty December 22d, 1863. His name is not upon the Pension List.

CASE.—Sergeant Allen F. Miller, Co. G, 34th Ohio Volunteers, aged 22 years. Winchester, Virginia, September 19th, 1864. Conoidal musket ball. Treated at division, Sandy Hook, and Satterlee hospitals. Returned to duty December 2d, 1864. Not on Pension List.

CASE.—Sergeant Milton Nash, Co. F, 130th Indiana Volunteers, aged 24 years. Atlanta, Georgia, August 6th, 1864. Conoidal musket ball. Treated at field, Knoxville, and Louisville hospitals. Discharged from service May 15th, 1865. Not a pensioner.

CASE.—Private Louis Nelty, Co, D, 149th New York Volunteers, was wounded, at the battle of Gettysburg, Pennsylvania, July 3d, 1863. He was admitted to a field hospital, where the injury was treated as a scalp wound. On July 16th, he was transferred to the Carver Hospital, Washington, where it was diagnosticated that the outer table of the cranium was fractured. He was returned to duty on October 19th, 1863. His name is not upon the Pension Rolls.

CASE.—Private Leon Rheims, 3d New York Artillery. Lee's Mill, Virginia, April 16th, 1862. Treated at Christian street and Fifth street hospitals, Philadelphia. Returned to duty August 8th, 1862. Not a pensioner.

CASE.—Corporal Lloyd Seville, Co. F, 1st New Jersey Volunteers. Treated at Judiciary Square Hospital, Washington, September 14th, 1862. Discharged from service December 13th, 1862. His name does not appear on the Pension Rolls.

CASE.—Private *D. J. Smoot*, Co. G, 4th North Carolina Regiment. Gunshot fracture of outer table of the skull. Treated at Chimborazo Hospital, Richmond. Transferred to Salisbury, North Carolina, June 6th, 1864.

CASE.—Private *T. M. Stricklin*, Co. F, 33d Alabama Regiment. Dallas, Georgia, May 27th, 1864. Gunshot fracture of outer table of the skull. Treated at hospital at Dalton. Furloughed May 30th, 1864.

CASE.—Corporal *F. L. Tarleton*, Co. I, 10th Alabama Regiment. Gunshot fracture of outer table of the skull. Treated at Howard Grove Hospital, Richmond. Furloughed May 24th, 1864.

CASE.—Private Moses Tonier, Co. K, 47th New York Volunteers, aged 32 years. Petersburg, Virginia, July 24th, 1864. Conoidal musket ball. Treated at corps, Fort Monroe, and Whitehall hospitals. Discharged from service February 20th, 1865. Not a pensioner.

CASE.—Private John Torborg, Co. K, Purnell's Legion. Cold Harbor, Virginia, June 3d, 1864. Treated at corps, Alexandria, and Satterlee hospitals. Mustered out of service October 27th, 1864. Not on Pension List.

CASE.—Private *S. E. Wood*, Co. F, 21st Virginia Regiment. Winchester, Virginia, September 19th, 1864. Conoidal musket ball. Treated at field and West's building hospitals. Transferred for exchange October 17th, 1864.

Of these patients, thirteen were Union and seven Confederate soldiers. Seven went to duty, five were discharged, and six were furloughed. One was exchanged, and one is unaccounted for. None were pensioned. The nature of the missile is referred to in eight of the cases only, being a shell fragment in one, and conoidal musket balls in seven cases.

Of the whole number of one hundred and thirty-eight cases of alleged gunshot fracture of the external table only of the skull, one hundred and eleven appear in the Union, and twenty-seven in the Confederate, reports. There were twelve deaths, two of which were not due to the injuries, but to intercurrent diseases. Of the Union men forty-five were discharged, fifty-six went to duty, three recovered and deserted, and seven died. The names of twenty-six of the Union men who recovered are found on the Pension Rolls. Those wounded in the supra-orbital region frequently suffered from impairment of the senses of vision or of smell, and those struck in the mastoid region, from injury or destruction of the sense of hearing. One suffered from numbness of the lower extremities, another from convulsions, and several from vertigo and dizziness. Of the twenty-seven Confederates, three died, six recovered and were exchanged, and eighteen were "furloughed" from hospitals within their own lines, and it is only known of their ulterior history that two of them were "retired" by medical boards.

I have presented brief memoranda of the one hundred and thirty-eight alleged examples of gunshot fracture of the external table of the skull, in deference to the experienced surgeons who have reported such accidents; but after a careful examination of the histories of the individual cases, and weighing the evidence impartially, I am sure, I am disinclined to admit that the outer table of the skull is ever fractured in the adult without injury to the inner table, either by projectiles of war or any other external violence, except in the rare instances, enumerated at the begining of this subsection, of blows or the impact of missiles upon the superciliary ridge, or mastoid or zygomatic processes, and possibly,

the occipital protuberance, or by grooving by a sharp shell fragment. Pott, Sir Astley Cooper, Sir Benjamin Brodie, Williamson, and others, refer to indentations of the skull or fractures of the outer table as not uncommon; but I believe the view entertained by Velpeau and Samuel Cooper, which I have endeavored to illustrate and corroborate to be the sound one. The reader who would examine further this interesting subject may consult the authorities referred to in the foot note.*

Gunshot Fractures of the Inner Table of the Skull.—The returns furnish twenty examples of fractures of the vitreous table of the skull without fracture or depression of the outer table. In ten of these cases, the pathological specimens were preserved and forwarded to the Army Medical Museum. Of the ten cases in which the specimens are wanting, one was observed by Surgeon John Shrady, 2d Tennessee Volunteers, who published an account of it at the time.† A more minute history has been found in the case-book of the hospital in which the patient was treated:

Case 1.—Private Matthias A. Tapyer, Co. I, 97th Ohio Volunteers, at the battle of Murfreesboro', Tenn., January 3d, 1863, received a slight scalp wound, from a glancing musket ball, near the antero-superior angle of the left parietal. He made light of his injury, which caused little pain; but was sent to Nashville on the 5th, and was admitted into Hospital No. 19. Examination with the probe failed to detect any injury of the skull. Simple dressings were ordered and the patient was allowed the liberty of the ward. For the next few days he was restless and irritable, and kept getting in and out of bed; but these symptoms were not regarded as significant, as the patient gave rational answers when interrogated. On the 10th, the ward-master reported that the patient was exceedingly restless at night, and he thought, at times, delirious, at all events "very strange in his actions." The attending surgeon found "nothing abnormal, except a white tongue and accelerated pulse and a puffy appearance of the scalp wound." As the patient still replied intelligently to questions, these phenomena appear to have excited little solicitude, and no active treatment was instituted. On the 15th there was great gastric irritability, the blandest liquids being rejected and the bowels were obstinately constipated. The patient lay in a state of stupor, the flexors of the upper extremities strongly contracted, with occasional subsultus; the pupils dilated and irresponsive to light. He was ordered five grains of iodide of potassium thrice daily, and an ounce of castor oil with a drop of croton oil immediately. It is not mentioned whether these medicines were retained or not, or whether enemata were given. But on the 16th, there was no amelioration of the symptoms, and the cathartic was ineffectually repeated. On January 21st the nurse reported that the patient had "not had a movement from his bowels since his admission." At this date "all of the symptoms were aggravated;" the patient was, however, still sufficiently conscious to endeavor to protrude his tongue when asked to do so, and to manifest his aversion to "a more thorough examination of the wound." The propriety of trephining was considered, but it was thought that the proximity of the longitudinal sinus to the seat of injury forbade this expedient. A crucial incision of the scalp was made across the wound, and about two drachms of pus escaped. The bone was found to be denuded over a space of the size of a dime. The patient died on the following day, January 22d, 1863. At the autopsy, when the calvarium was removed, a fissure of the inner table was discovered an eighth of an inch to the left of the sagittal suture, with slightly depressed sharp and jagged edges. For a space of two square inches about this fissure the dura mater had undergone structural alteration. Underneath the dura mater was an abundance of thick greenish pus. The brain substance beneath the diseased membrane was softened and friable. The cerebral veins were turgid.

The next case appears on the report, for the third quarter of 1864, of the general hospital at Grafton, West Virginia:

Case 2.—Private Elijah Bennett, Co. A, 116th Ohio Volunteers, aged 39 years, was wounded at the engagement at Piedmont, Virginia, June 5th, 1864, by a conoidal musket ball which grazed the top of the head tearing up the scalp. He was treated in a field hospital until the 19th, and then transported to the general hospital at Grafton and placed under the care of Surgeon Socrates N. Sherman, U. S. Vols. He was then laboring under symptoms of subacute meningitis, with compression of the brain. He died three days after admission, June 22d, 1864. At the *post mortem* examination a depressed fracture of the inner tables of both parietals was discovered, the fissures crossing about the middle of the sagittal suture. Beneath the depressed portion of bone the dura mater was extensively diseased and a large abscess had formed.

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*Pott, *Observations on the Nature and Consequences of Wounds and Contusions of the Head*, London, 1760, p. 15. *Sir* Astley Cooper, *Lectures*, London, Vol. I, p. 302. Saucerotte, *Mémoire de l'Academie de Chirurgie*, T. IV, ed. 1819, p. 322. Hennen, *Military Surgery*, 2d ed. p. 323. *Sir* Benjamin C. Brodie. *Works collected and arranged by Mr. Charles Hawkins*, London, 1865, Vol. III, p. 25. Velpeau. *De l'Opération du Trépan dans les plaies de Tête*, Paris, 1834, p. 27. *Medico Chirurgical Transactions*, Vol. XVI, p. 331. Williamson, *Military Surgery*, London, 1863, p. 28. Macleod, *Notes, etc.*, (already cited) p. 177. Matthew, *Med. and Surg. Hist. of British Army in the Crimea*, (Op. cit.,) Vol. II, p. 28. Guthrie, *Commentaries*. Chisholm, *Manual, etc.*, (Op. cit.,) p. 292. Teevan, *Experimental Inquiries into certain Wounds of the Skull*, in *British and Foreign Medico-Chirurgical Review*, Vol. XXXIV, p. 205. Miller, *A System of Surgery*, Edinburgh, 1864, p. 628, Pirrie, *The Principles and Practice of Surgery*, London. 1860, p. 273. Denonvilliers et Gosselin, *Compendium de Chirurgie Pratique*, Paris, 1851, T. II, p. 578. Adams, in *Costello's Cyclopedia of Practical Surgery*, Vol. II, p. 476. Langtih, *Programma de sinus Frontalis vulnere sinus Terebratione curando*, Wittemb. 1748. Schneider, *Die Kopferletzungen*, Stuttgart, 1848, p. 69.

†*American Medical Times*, Vol. VI, p. 113, March 7th, 1863.

A third case is noted in the case-book of Hospital No. 1, Frederick, Maryland, in charge of Assistant Surgeon Robert F. Weir, U. S. A.:

Case 3.—Private Hamilton West, Co. G, 5th West Virginia Volunteers, aged 24 years, at the battle of Opequan, Virginia, September 19th, 1864, was struck on the left side of the back of the head by a musket ball which, apparently, inflicted only a scalp wound. After a primary dressing in a field hospital, he was sent to the depot for wounded at Sandy Hook, and thence to Frederick, Maryland, where, on the 24th, he was admitted to Hospital No. 1, under the care of Acting Assistant Surgeon R. W. Mansfield. The wound was doing well, he suffered no pain whatever, his general condition was good, and there was, apparently, every likelihood of a speedy recovery. Simple dressings to the wound were continued, and little else was done in the way of treatment. On October 3d convulsions of an epileptic character indicated some grave cerebral complication. An incision was made through the wound, but no injury to the cranium could be found. Wet cups were applied over the temporal regions and blisters to the nucha, and a terebinthinate enema was administered. The convulsions subsided under these measures and did not recur. But there remained a dull pain in the head, hebetude, and a febrile movement. On October 8th there were rigors, followed by acute pain in the side of the chest. Coma supervened, and death followed on October 13th, 1864. At the autopsy an ovoid scale of the external table was found necrosed. This was situated beneath the middle of the scalp wound and at the lower posterior angle of the left parietal. The line of demarcation was well marked, but there was not the slightest depression of the outer plate. On removing the skull-cap an angular fracture of the internal table was discovered at a point corresponding with the contusion in the outer table. This fracture was depressed to the extent of one line. The dura mater beneath was thickened and ulcerated over a space two inches in diameter. The vessels of the pia mater were much congested. Both the gray and white matter of the brain were softened. The softening was particularly marked in the left hemisphere near the corpus callosum. In the chest firm pleuritic adhesions were found, with effusion on the right side and with old tuberculous deposition at the apices. In the pulmonary parenchyma were several metastatic foci, containing a detritus of blood corpuscles mingled with pus. The lung tissue was friable. The liver was normal; the spleen weighed twelve ounces.

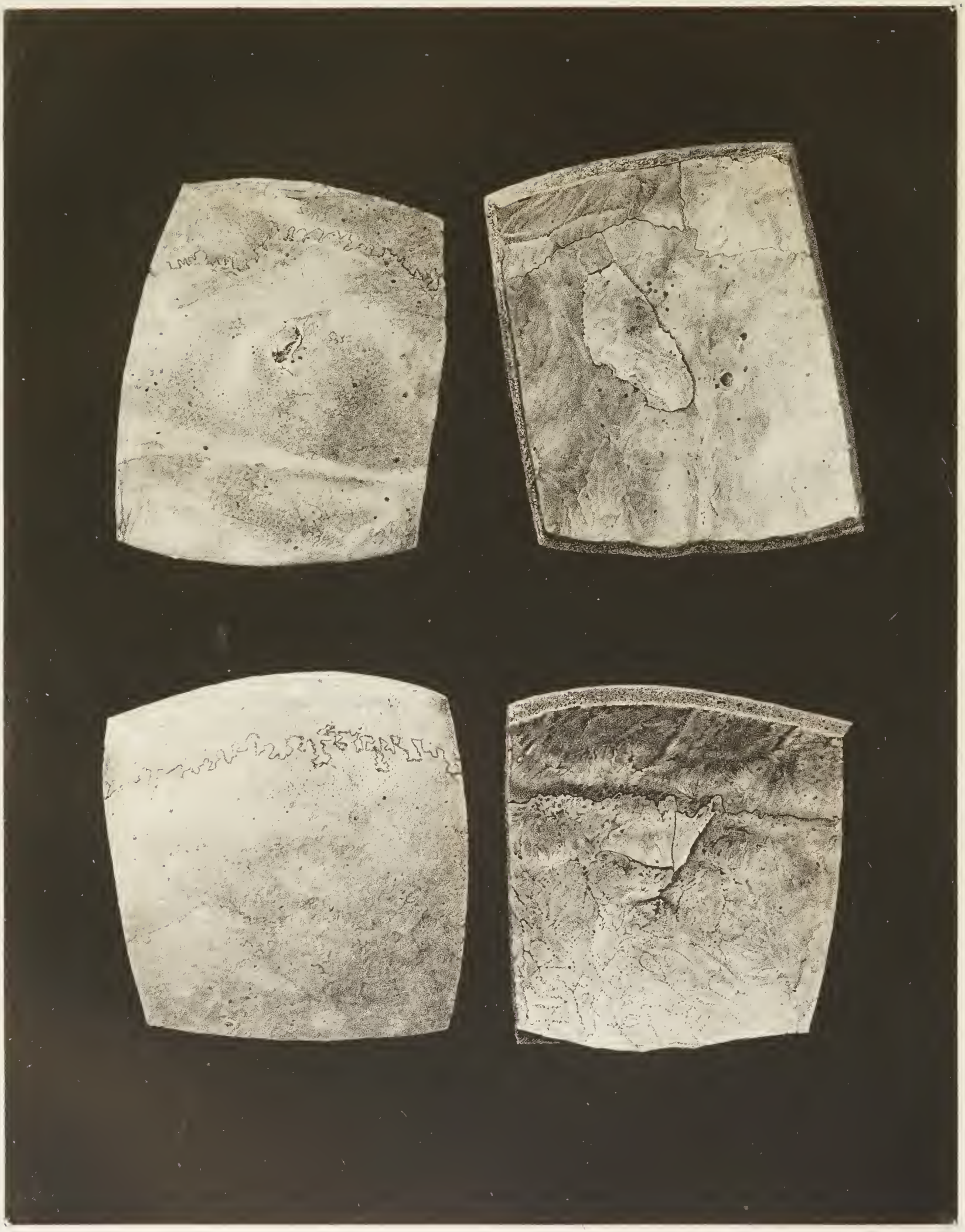
The next case is remarkable for the late apparition of inflammatory symptoms. It is noted in the reports of five hospitals:

Case 4.—Private Christian Boucher, Co. C, 118th Ohio Volunteers, aged 19 years, was wounded at the battle of Resaca, Georgia, May 14th, 1864, by a conoidal musket ball, in the occipital region; another ball injured the right testicle. He was at once admitted to the field hospital of the 23d Army Corps. On the register of this hospital the head injury is described as severe, but the symptoms are not particularized, nor the treatment detailed. In a few days the patient was sent, by the way of Chattanooga, to Nashville, Tennessee, and admitted to Hospital No. 1 on May 24th. Here the head injury was registered as a slight scalp wound. Nevertheless, the patient remained for a month at this hospital, and was transferred to Louisville, Kentucky, on June 26th. The case-books of the Nashville hospital afford no information respecting the progress and treatment of the case. On July 1st the patient was again transferred to Cincinnati, Ohio, where he was admitted to the Marine Hospital. He was found to manifest grave symptoms of cerebral disorder, the nature of which was not particularly specified in the hospital register. Insensibility, stupor, and indications of inflammation of the brain finally supervened, and the patient died July 14th, 1864. At the autopsy, when the calvaria was removed, it was found that a depressed spicula of the inner table, immediately beneath the wound in the scalp, had penetrated the dura mater, and that there was incipient softening, for an inch in diameter, of the brain tissue, immediately below this wound of the membrane. Apart from this limited result of inflammation, and the engorgement of the longitudinal sinus by coagula, the contents of the cranium were found in an apparently normal condition. An examination of the chest showed that the heart was healthy, that there was some deposition of tubercles in the lungs, and old and extensive adhesions of the right pleura. The abdominal viscera were healthy, with the exception of a slight enlargement of the spleen, and traces of subacute inflammation of the lower intestines. But the lesions in the thoracic and abdominal cavities were insufficient to cause, or even to hasten materially, a fatal issue. The record of the case at the Marine Hospital, Cincinnati, is compiled by Assistant Surgeon F. Grube, U. S. V.

Case 5.—Private J. W. Patterson, Co. B, 1st Iowa Volunteers, aged 21 years, was wounded at Tupelo, Mississippi, July 14th, 1864, and is reported by Surgeon J. N. Niglas, 6th Illinois Cavalry, on the casualty list of the right wing of the 16th Army Corps, as having a "dangerous gunshot wound of the head," produced by a fragment of shell. The patient being conveyed to the rear, was admitted to Adams Hospital, at Memphis, Tennessee, on July 21st, and died on July 24th, 1864. No particulars of the treatment are recorded, but on the monthly hospital report, signed by Surgeon J. G. Keenon, U. S. V., it is stated that "the external table, not being in the least fractured, no operation was performed;" and the report goes on to state that the patient presented many symptoms of compression of the brain, yet they were judged insufficient to justify operative interference. Furthermore, that a *post mortem* examination was made, and that upon the skull-cap being removed, "the internal table of the cranium was found to be severely fractured, and fragments of bone were pressing on the brain, while several abscesses had formed just under the dura mater." Efforts to obtain the specimen, or further particulars of the case, have been fruitless.

The next case furnished a typical specimen of this rare form of injury:

Case 6.—David H. P———, Co. C, 35th Wisconsin Volunteers, aged 20 years, detailed probably as an orderly, since his regiment was not in the action, was wounded, at the engagement at Tupelo, Mississippi, July 18th, 1864, by a musket ball which struck the skull obliquely, and apparently inflicted a scalp wound merely, between the sagittal suture and the left parietal protuberance. There were no signs of cerebral disturbance. The wound was dressed simply, and the patient was conveyed to Memphis, Tennessee, and admitted into the Adams U. S. General Hospital on July 23d. He was then perfectly rational and free from head symptoms. Two days subsequently indications of compression of the brain were observed, and on the afternoon of the 25th they had rapidly become aggravated. The pulse was slow, the respiration labored, the pupils dilated,



the sphincters relaxed. A very careful exploration of the wound was made, but, of course, no cranial fracture could be detected. The treatment was limited to cold applications to the head, scarified cups to the nucha, and brisk purging. On the 26th the patient gradually became comatose. The discharges from the bowels and bladder were involuntary. The patient continued to sink on the 27th, and died at one A. M. on the 28th of July, 1864. At the autopsy the pericranium was found to be contused and detached at the seat of injury; but no alteration was visible in the outer table of the skull. Directly beneath the scalp wound the inner table was fractured and depressed. The fractured portion measured one and a quarter inches in length by three-quarters of an inch in breadth, and was composed of three triangular pieces of the vitreous lamina. The depression at the apex measured two lines. The dura mater was wounded and there was a large abscess in the left cerebral hemisphere. The specimen was contributed to the Army Medical Museum by Acting Assistant Surgeon R. W. Coale. It is well represented in Figures III and IV of the accompanying Plate.

Almost identical with this were the symptoms, progress, and result of the following case, though the extent of depression in the fracture of the inner table was less:

CASE 7.—Private Ole O———, Co. H, 15th Wisconsin Volunteers, 1st Brigade, 3d Division, Fourth Corps, was wounded on July 22d, 1864, at the battle before Atlanta, Georgia. The right side of his head was struck obliquely by a musket ball which tore up the scalp over the middle of the upper portion of the parietal without inflicting any apparent injury on the bone. Simple dressings were applied and the wounded man was conveyed by rail to the general hospital at Chattanooga, a distance of one hundred and twenty miles or more. He was admitted on July 28th, and was then laboring under symptoms of compression of the brain. He died on the 5th of August, 1864.* An autopsy revealed an abscess in the right hemisphere of the brain. The outer table of the skull showed no trace of injury. The inner table presented, a little below the anterior third of the sagittal suture, a lambdoidal fissure, the longer branch two inches, and the shorter three-fourths of an inch in length, one edge being slightly depressed. (See FIGS. 48 and 49.) The specimen was contributed by Assistant Surgeon C. C. Byrne, U. S. A.

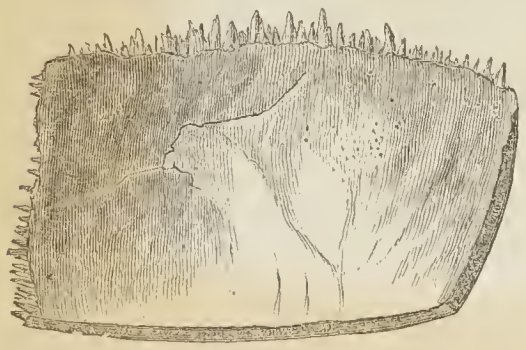


FIG. 48.—Lambdoidal fissure of the vitreous table of the right parietal. *Spec.* 3406, Sect. I, A. M. M.

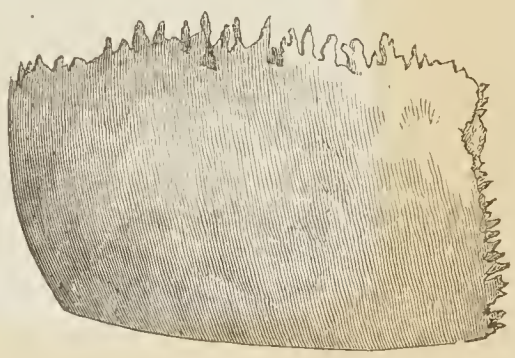


FIG. 49.—Exterior view of the same specimen showing absence of injury to the external table.

In the next case, without any apparent lesion of the external table, a fragment of the vitreous plate of the frontal bone was found to be completely detached and depressed upon the dura mater. It nearly resembles the case described and figured by Stromeyer in his "Maxims:"†

CASE 8.—Private Abram L———, Co. C, 77th New York Volunteers, 3d Brigade, 2d Division, Sixth Corps, aged 23 years, was wounded on May 6th, 1864, at the battle of the Wilderness, by a fragment of shell, which removed the scalp just below the coronal suture, and grazed the bone a little to the left of the median line. It has been impracticable to learn anything of the patient's condition for the next five days, during which he was in transit to the depot for wounded at Belle Plain; but, on May 12th, he was sent up the Potomac on a hospital transport, and was admitted to Armory Square Hospital, Washington, comatose and with his wound in an erysipelatous condition. Diligent and repeated examinations of the records and reports from Armory Square Hospital have failed to discover any account of the progress and treatment of the case. The patient died on May 24th, 1864. A segment of the frontal bone was removed and forwarded to the Army Medical Museum by Surgeon D. W. Bliss, U. S. V. Its external and internal surfaces are perfectly represented in Figures I and II of the foregoing plate. The outer table is not fractured; but is porous and softened where the pericranium was scraped off by the projectile. A meddlesome dissector has chipped off a bit of the external table and diploë with a scalpel in the endeavor to ascertain *post mortem* the degree of softening of the bone. A fragment of the inner table, one and one-fourth inches long, is completely detached.

After contusions of the outer with fractures of the inner table, where the pericranium is removed to any great extent, necrosis of the outer lamina occurs if the patient lives long enough, and a thin exfoliation is separated. The Museum possesses several illustrations of lesions of this nature, all of them resulting from the very oblique impact of projectiles:

CASE 9.—Private Conrad S———, 54th New York Volunteers, aged — years, was wounded at the second battle of Manassas, August 30th, 1862, by a musket ball which produced a scalp wound on the top of the head, across the sagittal suture,

* The Report for 1865 of the Adjutant General of Wisconsin gives August 10th as the date of death. The date above given is that entered in the official certificate signed by the surgeon in charge of the hospital.

† *Maximen der Kriegsheilkunst*, 2d ed. Hannover, 1861, S. 546, Figures 12 and 13.

parallel to and an inch behind the coronal suture. He was admitted to Finley Hospital, at Washington, on September 3d, and died of "inflammation of the brain" on October 20th, 1862. The records of Finley Hospital give no particulars of the progress and treatment of the case, nor of the appearances observed at the autopsy. A segment of the cranium was sent to the Army Medical Museum by Surgeon Israel Moses, U. S. Vols. It shows an exfoliation of the outer table a quarter of an inch by one inch, the surrounding bone being cribriform and spongy. The thin oval necrosed scale is not fractured or displaced. The vitreous table is fissured and slightly depressed. The wood-cuts give a satisfactory representation of the nature and extent of the lesions. (FIG. 50 and FIG. 51.)

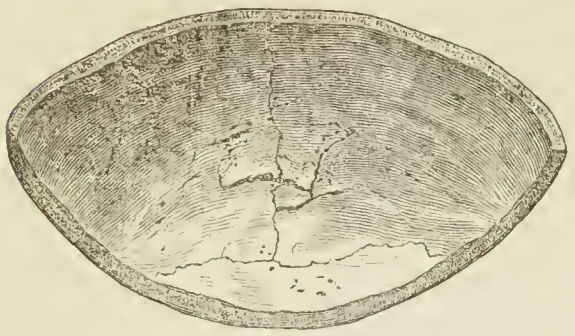


FIG. 50.—Depressed fracture of the vitreous table of the parietals an inch behind the coronal suture. *Spec.* 646, Sect. I, A. M. M.

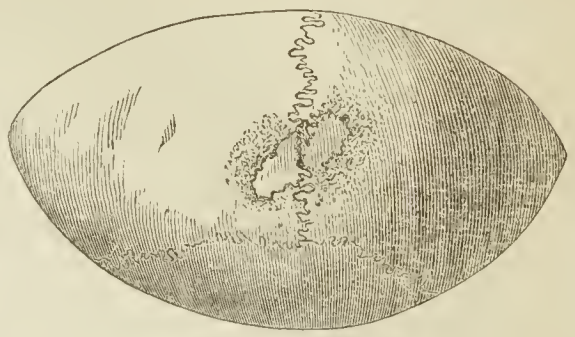


FIG. 51.—Exterior view of the same specimen, showing an exfoliation from contusion of the skull. *Spec.* 646, Sect. I, A. M. M.

The next case is remarkable for the absence of all symptoms of cerebral disorder until within a few hours of the patient's death:

CASE 10.—Private Daniel C———, Co. D, 76th New York Volunteers, was wounded at the second battle of Bull Run, August 30th, 1862, by a musket ball which inflicted a long transverse scalp wound near the vertex, the greater portion of the wound being over the right parietal. The wounded man was sent to Washington, and thence to Annapolis, where he was admitted to the General Hospital on September 8th. He was suffering from intermittent fever, and this diagnosis was placed upon his bed card, the wound being regarded as trivial in its nature. Treatment was directed to the interruption of the febrile paroxysms, which recurred obstinately in spite of the free administration of preparations of quinia. On September 23d, Assistant Surgeon J. W. Brewer took charge of the patient. The remainder of this abstract is compiled from his interesting notes of the case. The wound looked well at this date, and gave the patient no uneasiness; it was covered by florid healthy granulations, and discharged, in small quantity, laudable pus. The man had had no chill for twenty-four hours. Quinine was continued in small doses, and a generous diet was ordered. On the following day, September 25th, the patient complained of acute pain over the lower lobe of the right lung. There was no modification of resonance on percussion; and auscultation revealed no alteration in the respiratory murmur. Stupes of turpentine were ordered, and an aperient dose. At noon the pain in the side was much relieved; but the patient complained of violent pain in the right ankle, and in the foot of the same side. The cause of this pain, or of its location, could not be ascertained. At night, the pain was not relieved, and the patient was becoming very restless and irritable, which led Dr. Brewer to suspect some occult cerebral disorder, and again to examine the wound, and, finally, to request Assistant Surgeon T. H. Helsby, U. S. A., to see the patient with him. A careful exploration of the wound failed to detect any injury of the bone, a granulating surface being everywhere presented. In the absence of any symptoms, except restlessness, that could be referred to cerebral disturbance, it was concluded that the wound had no connection with the existing pain and general irritability, and the patient was ordered to have an anodyne, and a stimulating embrocation to the ankle. On the following morning, September 25th, 1862, coma suddenly supervened, and death promptly ensued. An autopsy was made, two hours after death, by Acting Assistant Surgeon B. B. Miles. The thoracic viscera were found to be in a normal condition, except that there was inflammatory engorgement, or possibly, hypostatic congestion only, of the lower lobe of the right lung. The abdominal viscera were carefully examined, but no cause of death could be found in that cavity. The calvaria was then removed. The dura mater was adherent to the bone beneath the site of the wound. A depressed stellate fracture of the vitreous table of the right parietal was discovered near the sagittal suture. A small quantity of pus followed the removal of the calvarium. On removing the dura mater, several ounces of pus were found on the surface of the left hemisphere. On closer examination, an aperture was discovered in the falx, and it became evident that an abscess had formed beneath the depressed fracture, and had burst through the falx, inundating the convolutions of the opposite hemisphere. The veins of the lower extremity, and of the lung were not examined, and whether the pain in the right foot and right chest were signs indicative of embolic complications resulting from the abscess was not determined. In concluding his report, Dr. Brewer again calls attention

FIG. 52.—Depressed fracture of vitreous table of the right parietal from gunshot contusion. *Spec.* 662, Sect. I, A. M. M.

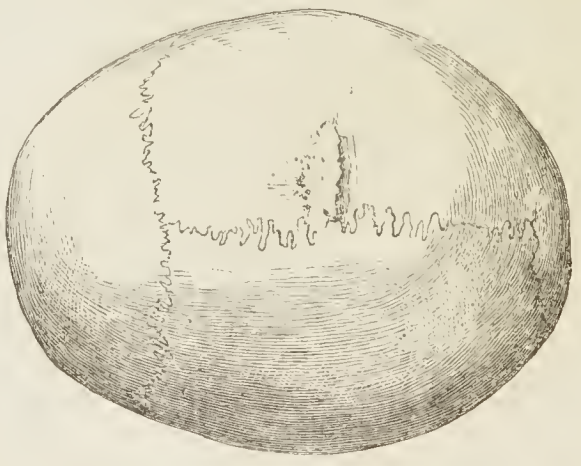


FIG. 53.—Exterior view of the same specimen, showing the exfoliation resulting from the contusion. *Spec.* 662, Sect. I, A. M. M.

to the fact that no symptoms of encephalitis appeared in the case; but it is to be remembered that the chills, which were reported as paroxysms of intermittent fever, did not come under his observation, and that no record of their attendant symptoms has been preserved. The calvaria was sent to the Army Medical Museum by Dr. Brewer. (FIG. 52 and FIG. 53.) The preparation is described in the Catalogue of the Surgical Section, (p. 8.) It is fairly represented in the foregoing wood-cuts as the vault of the cranium, showing a contusion of the right parietal bone at the middle of its superior border. The outer table is spongy, and a thin plate, one inch in length, is necrosed and partially separated. The internal table is fractured and slightly depressed, and shows traces of an attempt at repair.

CASE 11.—Private Cyrenus Sewell, Co. D, 2d New York Heavy Artillery, was wounded, at the battle of Spottsylvania Court-house, Virginia, May 19th, 1864, by a conoidal musket ball which struck the left parietal bone, near its articulation with the occipital, denuding the cranium for a space one inch in length and half an inch in width. No fracture of the cranium could be detected. He was admitted, on June 1st, to the Summit House Hospital, Philadelphia, complaining of pain in and about the part struck, but was otherwise doing well. On June 9th, he commenced to cough, became feverish, and, at times, delirious, and suffered from pain in the left chest. These symptoms continued for four days. On the 13th, he was almost wholly unconscious, could take no solid food, and could only with difficulty be induced to swallow fluids. He died on June 14th, 1864. The autopsy disclosed a small collection of pus under the scalp, at the seat of injury. There was no fracture of the external table. The missile had struck over a Wormian bone, the sutures of which were a little loosened, thus admitting a slight depression on pressure. On removing the calvarium, a fracture and depression of the internal table was detected; an angular piece, an inch in length and breadth, was found depressed a quarter of an inch or more. A large abscess was found on the left side of the brain, some distance from the surface, and pus in large quantities had collected under the dura mater. The left side of the brain was highly inflamed. The case is reported by Surgeon J. H. Taylor, U. S. V.

Some nosologists would perhaps exclude the following case from the category under consideration, since the outer table was grooved by the projectile which caused the injury. But I think it should find a place here as the outer table was incised rather than fractured, while the contunding force of the projectile was propagated to the internal table. In this as in the preceding case, the injury to the vault of the skull led ultimately to a formation of pus within the skull and to purulent infection probably; and in both cases the pyæmic symptoms appear to have been masked and mistaken for malarial complications.

CASE 12.—Private William McP———, Co. A, 101st Ohio Volunteers, aged 27 years, was wounded, at the battle of Chickamauga, September 20th, 1863, by a piece of shell, which inflicted a wound of the scalp three inches long and two inches wide over the left parietal bone. The pericranium was stripped off to a somewhat less extent; the external plate of the parietal was furrowed as if by a gouge. The patient's wound was hastily dressed, and he was then sent, by railway, to Nashville, where he was admitted to Hospital No. 1, on September 24th. His general condition was good; his pulse slightly accelerated, counting 90; all of the excretions were natural, and there were no head symptoms. He was put upon low diet, and cold water dressings were applied to the wound. There was no untoward symptom until October 3d, when he had slight fever and complained of headache and constipation. The pupils responded readily to light. He was ordered four compound cathartic pills. After being purged he appeared, on the following day, somewhat better. The cold applications to the head and restricted diet were continued. On October 5th, fifteen days after the reception of the injury, he had severe rigors, followed by a febrile movement and profuse sweating. Headache had returned with severity. He was directed to take three grains of sulphate of quinia every four hours, and the local treatment and rigid diet were continued. On October 6th, he was comfortable. He had, on the night of the 7th, another paroxysm of rigors, with violent febrile reaction. The dose of sulphate of quinia was raised to five grains, and eight grains of Dover's powder was prescribed with each draught. The local treatment and low diet were persevered in. On October 8th, there was no fever, and the pulse had fallen to 80; the headache continued. On October 9th, there was great complaint of the severity of the head symptoms. The pupils were slightly dilated, though still sensitive to light. There was great excitement and restlessness. The bowels were confined. He took two "compound cathartic pills," (U. S. P.) and cold irrigation to the head was employed. He was kept on low diet. The quinine and opium were omitted, and he was ordered a drachm of fluid-extract of valerian every five hours. On the 10th, there were severe rigors, followed by fever and coma. A terebinthinate enema was administered, without effect. On the 11th, the patient was still comatose. The dilated pupils sluggishly

FIG. 54.—Fracture with caries of the internal table of the left parietal. *Spec.* 1922, Sect. I, A. M. M.

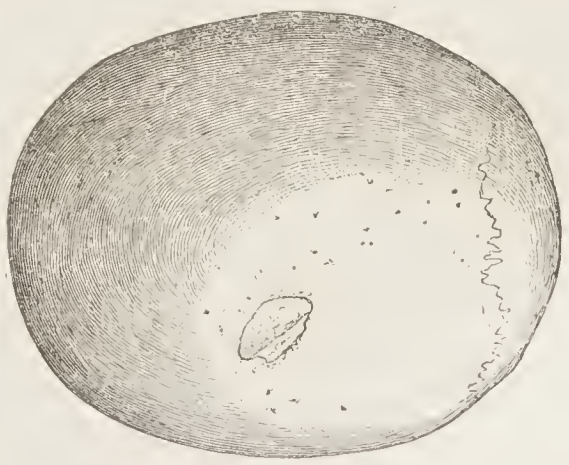


FIG. 55.—Exfoliation from outer table of left parietal resulting from grooving by a fragment of shell. *Spec.* 1922, Sect. I, A. M. M.

contracted when exposed to the light. He was ordered a powder of two and a half grains of calomel and three of bicarbonate of soda every four hours. On the 12th, his bowels were freely moved, but the cerebral symptoms were not modified. On the 13th, the coma was profound. The pupils were insensible to light. The respiration 15, and pulse 70 per minute. There was paralysis of the bladder. Involuntary alvine evacuations took place. The extremities were flexed and rigid. Death occurred on the afternoon of the 14th of October, 1863, twenty-four days after the reception of the injury. The autopsy was made ten hours after death. The body was moderately emaciated. The external plate of the left parietal above and in front of the protuberance was deeply grooved for about an inch. About this groove an ovoid necrosed portion of the outer table was separated by a line of demarcation. The calvaria, which was of unusual thickness, was removed and transmitted to the Army Medical Museum by C. J. Kipp, Assistant Surgeon, U. S. V. It is numbered 1922 of the Surgical Section. Its inner surface presented a fracture of the vitreous lamina without depression. About the fracture the bone was carious. A thick layer of pus interposed between the bone and the dura mater. Near the junction of the sagittal and fronto-parietal sutures, was an abscess containing two ounces of pus. The dura mater that covered the left hemisphere and the middle lobe of the right hemisphere was much thickened, and was of a dark greenish color. Along the walls of the longitudinal sinus, adhesions had formed between the dura mater and cerebral layer of the arachnoid. The longitudinal sinus was filled with coagula, and fringed with pseudo-membraneous exudation. The superficial cerebral veins were tinged with black blood. The grey substance of the external convolutions of the anterior and middle lobes of the left hemisphere, and of limited portions of the right hemisphere, were soft, and of a greenish color. There were no abscesses in the substance of the brain. The lateral ventricles contained about two fluid ounces of bloody serum. All of the thoracic and abdominal viscera were examined; but no abnormal appearances were observed in them. A segment of the diseased dura mater constitutes the preparation numbered 1923 of the Surgical Section of the Museum. Its external surface displays a dark discoloration over the surface corresponding with the necrosed portion of the calvaria. (See FIG. 56.) Its inner surface, likewise, is discolored over a space five inches in length and three inches in breadth, which is covered by an exudation of false membrane. Near the longitudinal sinus are numerous fungous tufts, in several of which bone has been developed.

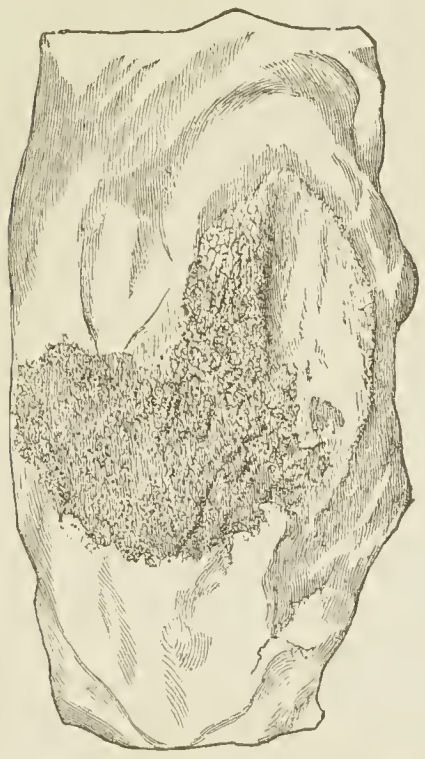


FIG. 56.—Portion of the dura mater covered with pseudo-membrane. *Spec.* 1923, Sect. I, A. M. M.

In the next case, also, the efforts of nature to repair the vault of the cranium were frustrated by the supervention of inflammatory mischief within the skull.

CASE 13.—Sergeant William H. B———, Co. K, 47th Pennsylvania Volunteers, aged 24 years, was wounded at the battle of Cedar Creek, October 19th, 1864. He believed that he was struck on the top of the head by a fragment of shell; but the wound had more the appearance of an injury inflicted by a musket ball. His name appears on the casualty lists, with the entry "flesh wound of the head—slight." He was sent to Newtown, and was thence transferred to Satterlee Hospital at Philadelphia, where he arrived on October 25th. A scalp wound two inches long was found about an inch behind the coronal suture and parallel to it. It extended further to the left than to the right side. The bone was denuded of periosteum over a space an inch long and half an inch wide. The bone appeared to be otherwise uninjured. The pupils were dilated, and the right side of the body was partially paralyzed. The patient complained of no pain; his appetite was good; he had slight diarrhœa. It does not appear that his diet was restricted, and no record is made of the measures adopted to combat the symptoms of compression of the brain. On October 27th, he had involuntary fœcal dejections, and more stupor, and hemiplegia was complete. He had a slight rigor on this day. On October 28th, he had a severe chill and his "appetite began to fail." Coma supervened, but the patient lingered a week longer, death taking place on November 5th, 1864. No description of the *post mortem* examination has been furnished. The skull-cap was sent to the Army Medical Museum. It shows externally (FIG. 58) the effects of a contusion of the outer table of the skull. A line of demarcation includes an elliptical partially necrosed plate with diameters of an inch and a quarter and of three-fourths of an inch. The internal table is fissured, and there are the marks of diseased action along the groove for the longitudinal sinus as far backward as the occipital bone. (FIG. 57.) Acting Assistant Surgeon Henry Mullen contributed the specimen, which is represented in the wood-cuts above.

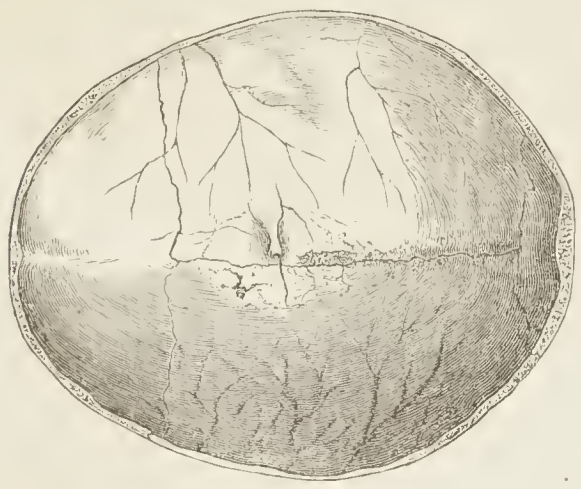


FIG. 57.—Depressed fracture of the inner table of the skull from a contusion of the outer table. *Spec.* 3639, Sect. I, A. M. M.

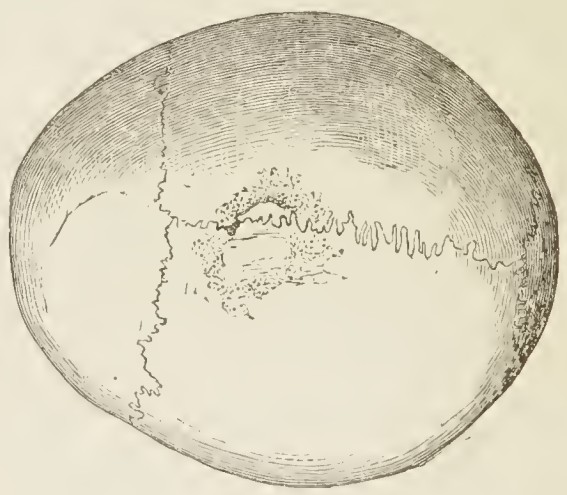


FIG. 58.—Exterior view of the same specimen, showing superficial exfoliation. *Spec.* 3639, Sect. I, A. M. M.

No cases of gunshot fractures of the inner table of the skull without external fracture have been noticed in the reports of the Confederate army medical department that have been filed in this office; but the following case, and another, recorded on page 148, pertain to Confederate prisoners who died in Union hospitals:

Case 14.—Private *James M. B———*, Co. D, 17th Virginia Infantry, 17 years of age, was wounded, at the battle of Spottsylvania, May 12th, 1864, by two conoidal musket balls, one of which passed through the lower portion of the right arm, grazing the outer surface of the shaft of the humerus, while the other denuded the bone on the upper left side of the forehead. He was taken prisoner, and was sent to Philadelphia, where he was received at Satterlee Hospital on May 20th, and placed under the care of Acting Assistant Surgeon M. Lampen. His general health was quite good; and the wounds were granulating kindly. He was allowed to be up and to walk about, and to have ordinary diet. On May 28th, he complained of headache; he had a slight febrile movement, and was constipated. The headache and feverishness persisted on the three following days, and on the 31st, there was a slight chill at two in the afternoon, followed by a severe rigor at five o'clock. A febrile reaction ensued lasting about an hour, after which the skin was cold and moist. The pulse was full at 84; the pupils were contracted; there was stupor but no paralysis; the tongue was heavily furred. During the three following days, there was active delirium, alternating with stupor and occasional lucid intervals. When conscious, the patient complained of pain in the head and abdomen. During this period the pulse averaged 110, and was weak and compressible. On June 5th, the left side of the face was œdematous. The patient was tolerably quiet. The urine and fæces passed involuntarily. On June 7th, the pulse was fluttering and very frequent. Profound coma supervened about one in the afternoon, and continued until the patient's death, which took place early on the morning of June 8th, 1864. From the date of accession of the headache and febrile phenomena on May 28th, the treatment consisted of brisk purging, the use of diaphoretics, cold applications to the head and revulsives to the lower extremities. Thirty hours after death, an autopsy was made by Acting Assistant Surgeon Charles P. Tutt. At the junction of the lower and middle thirds the right humerus was denuded of its periosteum. The wound on the forehead was an inch and a quarter in length and half an inch wide. On laying back the scalp a large amount of pus was found beneath it on the left side. The external table of the skull was not fractured, but above the left frontal protuberance, where the thin pericranium was extensively separated by the burrowing of pus, the bone was spongy and discolored. On removing the skull-cap, the internal surface of the cranium corresponding with the wound was found discolored, and presented a linear fissure an inch long without any depression of its edges. The dura mater beneath this space resembled a dark eschar in appearance, and was coated with pus. There was a considerable amount of pus upon the surface of both hemispheres. The vessels of the pia mater were much congested, and at the base of the brain there was a large effusion of serum. In one or two places in which the results of meningeal inflammation were conspicuous, the subjacent cerebral convolutions were superficially altered in color and texture. But the greater portion of the hemispheres, the ventricles, the cerebellum, pons Varolii, and the medulla oblongata were normal in appearance. Near the apex of the left lung, masses of unsoftened tubercles were found; there were extensive pleuritic adhesions, and a large amount of sero-purulent fluid in the cavity of the left chest. There were three large metastatic abscesses in the right lobe of the liver. The kidneys were enlarged and presented the appearance of the first stage of fatty degeneration. The specimen and memorandum of the autopsy were contributed by Dr. Tutt.

Fig. 59.—Fissure of inner table of frontal bone, from a gunshot contusion. *Spec.* 2747, Sect. I, A. M. M.

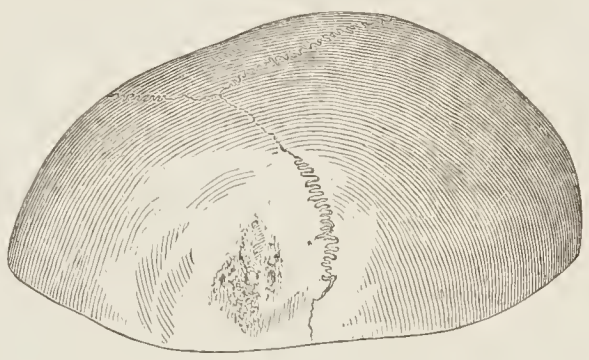


Fig. 60.—Exterior view of the same specimen, showing the spongy texture of a contusion near the left frontal eminence. *Spec.* 2747, Sect. I, A. M. M.

The next case is remarkable, as it appeared to indicate that a gunshot fracture of the inner table alone of the frontal bone may be caused by the oblique impact of a projectile upon the superciliary ridge. It is probable that the blow was not over the sinus, but upon a portion of the bone supplied with diploë.

Case 15.—Corporal William McCord, Co. I, 14th Michigan Volunteers, at Chattahoochie, Georgia, July 5th, 1864, was struck over the right superciliary ridge by a conoidal musket ball. He was scarcely aware of being wounded, so slight were the immediate effects of the injury. The bleeding obliged him to leave the ranks, and he was examined by Surgeon Edward Batwell,* 14th Michigan Volunteers, who stated that he had been struck by a glancing ball, which had cut through the integuments, apparently leaving the bone intact. He went to a division hospital of the Fourteenth Corps; but though complaining of slight headache, he returned next day voluntarily to duty with his regiment. On the eighth day from the reception of the injury, in consequence of severe pain in the seat of the wound, he reported at the hospital. Next day the pain was diminished, and he felt considerably better, but had irregular chills through the day, followed by slight fever. On the

* Surgeon E. Batwell has published an account of this case in the *Michigan University Journal*, Vol. I, No. 5, July, 1870, page 270.

morning of the tenth day he was very drowsy and snappish, and evening brought an increase of these symptoms, and at night he was comatose and insensible, and death ensued soon after. According to Surgeon Batwell's dates, he died on July 16th; but the report of the adjutant general of Michigan and the register of the Fourteenth Army Corps agree in giving the date of death as July 28th, 1864. A *post mortem* examination revealed a fracture of the inner table of the skull, with slight depression, though none was visible on the external surface, with an abscess, containing about two ounces of pus, under the seat of injury and in the substance of the brain. Dr. Batwell remarks: "The curious points of this case are the absence of urgent symptoms during the first nine days, and the rapidity of their development within the last twenty-four hours."

In the four following cases of gunshot fracture limited to the inner table of the skull, trephining was unavailingly performed. In all of them the exact nature of the cause of the cerebral compression for which the operations were performed was necessarily only conjectured, and perhaps in CASE 17, only, was the existence of a fracture of the vitreous table surmised. The operations were performed on general surgical principles to relieve compression of the brain. That they were unsuccessful, only corroborates the opinion that has been so strongly impressed on the minds of surgeons of the present day, that authentic examples of successful trephining for matter between the bone and dura mater are now very rarely cited. It will be noticed that those who died from encephalitis survived from ten days to a fortnight, while those who died from abscess of the brain lived about three weeks:

CASE 16.—Private William Casey, Co. H, 69th New York Volunteers, was wounded in the head at the battle of Fair Oaks, Virginia, June 1st, 1862. He was admitted to the regimental field hospital, and thence sent, on an hospital transport steamer, to Philadelphia, where he entered the South Street Hospital, on June 8th, being insensible on admission. There was a lacerated wound of the scalp, near the right parietal eminence, but no fracture of bone could be detected. Cold water dressings and adhesive strips were applied, and on the next day the patient aroused and became quite rational. On the afternoon of the 12th, he manifested much nervous anxiety, with nausea and retching. He soon afterwards had a violent chill. His head was very hot, and the pupils were contracted. The adhesions of the wound were broken up, and cold applications were made to the head. There was little change in his condition until June 15th, when the stupor and other signs of cerebral compression became more marked, and it was decided to apply the trephine. A button of bone was removed. Upon perforating the skull an immense amount of sanious pus flowed through the orifice, but the condition of the patient was not ameliorated. He remained comatose until death, which occurred on June 16th, 1862. A careful *post mortem* examination revealed a fracture of the internal table of the cranium, and an immense cerebral abscess involving all the convolutions and the pia mater of the right hemisphere. The case appears to have been attended, and the operation performed, by Acting Assistant Surgeon J. Hopkinson; but, unfortunately, no special report was made, and the disposition made of the specimen is unknown. The Army Medical Museum was not then established, and this, and many other pathological preparations obtained at the time, probably passed into private hands. The facts above recorded are gleaned from the monthly report, prescription book, and case book of the South Street Hospital.

CASE 17.—Private *Denis S*———, Co. E, 2d Virginia Cavalry, aged 21 years, was wounded, in an engagement at Harper's Farm, near Appomattox Court House, on April 6th, 1865, by the oblique impact of a musket ball which denuded and contused the frontal bone a little below the coronal suture and to the left of the median line. Being taken prisoner, he was placed in a field hospital where a water dressing was applied, the hair being shaved off to a suitable extent. A few days subsequently, he was sent to the rear, and he reached Washington a fortnight after the reception of his wound, and was placed in Harewood Hospital on April 19th. He had a chill soon after his admission, and reported that for some days he had suffered from two paroxysms of ague daily. He had no pain in the head, nor any symptom to excite apprehension as to the condition of the brain, except the chills, which were ascribed to malarial influence. They proved, however, not to be amenable to quinia, which was freely administered, for several days, without advantage. On April 24th, a slight congestion of the lower lobe of the right lung was noticed. The next day pneumonia was fully developed here, and on the 26th the greater portion of the right lung was involved, and there was acute pain in the cardiac region, with a souffle accompanying the first sound of the heart and a murmur of regurgitation the second sound. The pulse rose rapidly to 156; but fluctuated greatly in frequency and force. At ten in the evening of this day the patient became comatose. Shortly afterwards, Surgeon R. B. Bontecou, U. S. Vols., applied the crown of a small trephine on the right of the space in which the pericranium was removed. When the outer table was passed, pus began to exude from the cells of the diploë. When this was penetrated a depressed fracture of the inner table was discovered. Another perforation was now made to obtain space to remove the depressed fragments of the vitreous plate. A small fragment and another measuring nine by six lines were found completely detached, and were removed by common dissecting forceps. The operation had no influence upon the profound coma, that persisted until the patient's death, which took place on the following morning, April 26th, 1864. At the

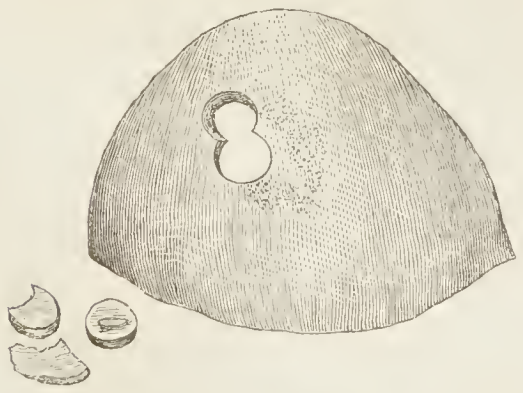


FIG. 61.—Segment of a cranium trephined for a depressed fracture of the inner table. *Spec.* 4344, Sect. I, A. M. M.

autopsy, a large abscess was found in the substance of the right cerebral hemisphere. A segment of the frontal bone, with the two disks and the larger fragment of the inner table, removed at the operation, were forwarded to the Army Medical Museum by Surgeon R. B. Bontecou, U. S. V., and are represented in the accompanying wood-cut, (FIG. 61.) A view of the interior of the specimen is given in FIG. I, of the Catalogue of the Surgical Section of the Army Medical Museum, (p. 6,) and in the Surgical Report in *Circular* No. 6, S. G. O., 1865, p. 11, FIG. 6, and a photograph of the patient, taken a few hours prior to the operation, is preserved at the Museum, as No. 58, Vol. I, of the Series of Contributed Photographs of Surgical Cases. The lower figure in Plate III, opposite page 105, is copied from the photograph, and represents the appearance of the patient after the graver symptoms of compression of the brain had set in.

CASE 18.—Private Charles H. Leonard, Co. H, 57th Massachusetts Volunteers, aged 22 years, was wounded, at the battle of the Wilderness, Virginia, May 6th, 1864, by a conoidal musket ball. He was conveyed to Washington, D. C., and, on May 11th, admitted to the Columbian Hospital. There was a wound of the scalp over the left occipital protuberance, but the external table was not fractured. On May 15th, Acting Assistant Surgeon H. D. Vosburgh applied the trephine, removed a portion of bone, and took out a fragment of the inner table, which was lying loose on the dura mater. Coma supervened, and death occurred on May 17th, 1864, from encephalitis.

CASE 19.—Private John R. Montgomery, Co. A, 9th Illinois Volunteers, aged 30 years, was wounded, at the siege of Fort Donelson, Tennessee, February 14th, 1862, by a buckshot which inflicted a scalp wound over the right parietal bone, and lodged. Three days after the reception of the injury, the patient was admitted to the hospital of the 2d division of the Fifteenth Corps. An examination of the wound revealed an opening in the scalp of the size of a pea. The missile could not be detected by the probe. There was no depression of the skull, and only a slight denudation of the pericranium could be discovered. The patient felt well, ate heartily, was able to walk about the ward, read newspapers, and considered his wound of slight importance. On February 19th, he was attacked with clonic spasms of the left side of the face and left extremities. They recurred about every ten minutes at first, and rapidly augmented in frequency, becoming, in an hour, almost continuous. Trephining was determined upon, and the patient being placed under the influence of chloroform, the scalp was reflected. A portion of the skull of the size of a shilling was found to be denuded of periosteum and somewhat roughened, but no fracture or depression was evident. Upon perforating the external table, the inner table was found to be broken and splintered to a considerable extent. A clot of blood was found upon the membranes of the brain, and on its removal the patient aroused and became conscious, without recurrence of the convulsions. The splintered portions of the internal plate were removed, the scalp was replaced, and simple dressings were applied. On the two days following, the patient was doing well, and the spasms did not recur. Early on the morning of February 22d, convulsions suddenly came on again; but ceased when Dr. Fisher explored the wound with a probe, and removed some coagula. On the 23d, the convulsions recurred, and soon became almost incessant. There were short lucid intervals during the day, when the patient conversed rationally; but he was evidently becoming comatose, and answered questions with much difficulty of articulation. On the 24th, a consultation was held by Drs. Fisher, Boone, and Heydock, and it was decided to remove another portion of the skull. The patient was chloroformed, and Dr. Fisher applied the trephine and removed a button of bone from the anterior edge of the perforation previously made. The wound was cleaned with a syringe, the patient rallied, the convulsions ceased for six or eight hours, and the symptoms improved. The wound began to discharge freely; but drowsiness and insensibility came on, and the patient went into a profound coma, and died on the afternoon of February 25th, 1862, eleven days after the reception of the injury.

The next case is a very remarkable example of contusion of the occipital bone by a musket ball, without apparent injury to the outer table, and with depressed fracture of the inner table, followed by an exfoliation of the entire thickness of the bone that had been divested of its periosteal covering. This patient was the solitary survivor of this form of injury in whom the diagnosis could be verified:

CASE 20.—Private John Donovan, Co. I, 97th Pennsylvania Volunteers, aged 18 years, was wounded, on July 14th, 1864, in an engagement of the Eighteenth Corps before Petersburg, by a conoidal musket ball which tore up the scalp over the occiput. He was taken to the corps hospital, and was thence transferred to the general hospital at Fort Monroe, on July 16th. On July 25th, he was sent to New York, and was admitted, on the 27th, to the McDougall Hospital at Fort Schuyler. Here he remained until the 31st of August. The records of these three hospitals simply announce the date of his admission and transfer with "gunshot wound of the head," and afford no further information relative to the nature of the injury or the progress and treatment of the symptoms which it induced. On August 31st, Private Donovan was moved to Philadelphia, and entered Broad and Cherry Streets Hospital on the same day, and came under the charge of Acting Assistant Surgeon H. M. Bellows, who has reported to the Surgeon General the little that is known of this most interesting case. The patient, on entering Broad and Cherry Streets Hospital, brought no written account of his case, but he stated that he had suffered from fever at Fort Schuyler, and was now supposed to be convalescing. He was anæmic, feeble, and very much emaciated. He complained of constant chilliness and of headache. Over the right branch of the lambdoidal suture there was a wound presenting a healthy granulating surface at the edges, while in the middle, denuded bone was revealed. A tonic regimen was prescribed, and emollient dressings were applied to the wound. For the next two months these measures

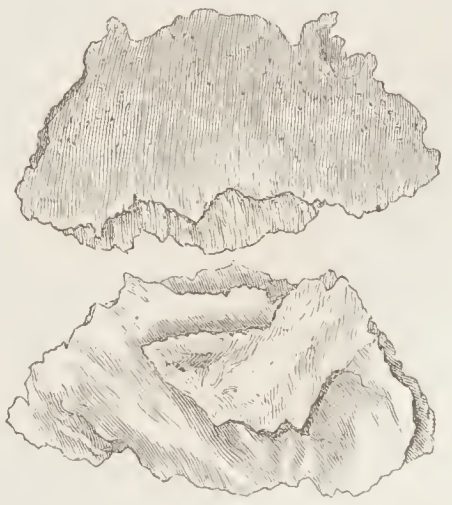


FIG. 62.—Necrosed fragment from the right parietal, showing a depressed fracture of the inner table without lesion of the external. *Spec.* 4194, Sect. I, A. M. M.

were unchanged and the general health of the patient steadily improved. The wound gave little inconvenience, but it was obvious that it would not close until an exfoliation should take place, or the dead bone should be otherwise detached. On November 3d, the patient was granted a fortnight's furlough to visit his family. On his return it was found that the denuded bone was movable, and on November 23d a necrosed fragment of the entire thickness of the cranium, an inch and a half long, was extracted by Dr. Bellows. The dura mater beneath, through which the pulsations of the brain could be distinctly perceived, was perfectly normal in appearance. The wound finally closed on January 28th, 1865. On March 2d, the man was invalided and transferred to the Veteran Reserve Corps. On May 29th, 1865, he was discharged, on surgeon's certificate of disability, by reason of "fracture of the skull, producing irritation of the brain." The specimen illustrated by FIG. 62 is a portion of bone from the posterior portion of the right parietal, near the occipito-parietal suture, measuring an inch and a half in length and a little less than an inch in breadth. The outer table is unbroken. The vitreous table presents a fracture depressed about one line. This invaluable specimen was contributed to the Museum by Dr. Bellows. This pensioner is reported on March 9th, 1870, as examined by a board, of which Drs. Harper, Smith, Reed, and Goodman were members, as totally disabled, attacks of vertigo rendering him incapable of any physical exertion. The loss of substance of the skull had been partly replaced by bone, partly by fibrous tissue.

Of these twenty patients, but one recovered. The interval between the reception of the injury and the fatal termination, in the other nineteen cases, varied from ten to sixty-one days. The average duration of life was twenty-two days. In thirteen cases, there was suppuration beneath the dura mater; in two, pyæmia and metastatic foci supervened, and in four there was encephalitis and softening of the brain substance. In four cases, the blow was inflicted upon the frontal region; in thirteen, upon the parietal, in two, on the occipital, and in one, the site of the injury is not specified. In fourteen instances, the injury was caused by the oblique impact of musket balls; in four cases, by shell fragments; in one case, by a buckshot; and in one case the nature of the, projectile is not stated.

It has been supposed that this form of fracture was known to Hippocrates, Celsus, Paul of Ægina, Vidus Vidius, and other ancient writers,[1] who regarded the accident as dependent upon a species of *contre-coup*, said to have been called ξυμφουν, or Απηχημα, or *resonitus*. But an examination of the references made to the works of these authors, shows that they did not clearly describe the injury under consideration. Mr. Teevan correctly observes,[2] that one of the earliest writers who was aware of this lesion was Jacobus Berengarius;[3] but the first recorded case appears to be that of Ambroise Paré,[4] who relates, that a nobleman of M. d'Estampe's company was wounded, at the breach of the chateau of Hedin, by a ball from an arquebuse, which he received on the parietal bone, and died apoplectic on the sixth day. Neither the scalp nor the external table of the skull were broken; and Paré, wishing to know the cause of death, opened the skull, and found the second table depressed, the outer table being entire. Garengeot,[5] next reports a case by M. Mery, successfully trephined. Saucerotte,[6] in his memoir on fractures of the skull by *contre-coup*, quotes these cases, and adds one from Tulpius,[7] resulting from gunshot injury, and terminating fatally on the sixth day, after trephining. LeDran[8] records an example of this injury, produced by a fall from a scaffolding, trepanning having

[1] HIPPOCRATES, *De Capitis Vulneribus*, Lutetiæ, 1578. CELSUS. *De Medecina*, L. VIII, cap. IV. p. 516. Lugduni, 1785. ARCŒUS, *De recta curandorum Vulnerum ratione*. Cap. III, p. 3. Amstelodami, 1658. VALLERIOLA, *Observationum Medicinalium*, lib. 6.

[2] *The British and Foreign Med. Chir. Rev.* Vol. XXXVI, p. 189.

[3] BERENGARIUS, *De Fractura Cranii*. Bologna 1535. I have not been able to consult the princeps edition; but the passage is repeated in the edition in the Surgeon General's Library, *Lugduni Batavorum*, 1715. *Liber Aureus, Hactenus desideratus. Editio nova, etc.* p. 6.

[4] PARÉ. *Oeuvres*, ed. 1653. T. X, p. 225.

[5] GARENGEOT, *Traité des Opérations de Chirurgie*. Paris, 1738. 2d ed. T. 3, p. 122.

[6] SAUCEROTTE, *Mém. sur les sujets proposés pour les Prix de l'Académie Royale de la Chirurgie*. T. IV, p. 322.

[7] TULPIUS, *Observationes Medicæ*. Lugduni Batavorum, 1716. p. 3. Guthrie seems to think that the cracks in the inner table were made by the surgeon. See *Injuries of the Head, etc.* London, 1842, quarto, p. 73.

[8] LE DRAN, Obs. de Chir. T. I, obs. 17.

been performed unsuccessfully. Pott[1] relates two examples of fracture of the inner table alone: one of a young woman pitched from a wagon, and striking on the head on a flat pavement, trephined on the fourth day, but dying from suppuration between the skull and dura mater; the other of a porter knocked down by an iron hook, who walked home, but next morning lost the powers of speech, power, and locomotion; after his death, on the third day, a piece of the vitreous plate of the right parietal, an inch and a half long, was found detached. Pott adds that these are the only instances he had met of fracture of the inner table alone; but that he made no doubt, that some of those "thought to have been destroyed by concussion, have sunk under this kind of mischief."

Bilguer[2] relates that "at the battle of Torgau in 1760, Colonel von Lossau, Chief of the Grenadier Battalion, was wounded by a small bullet on the centre of the right frontal bone, in such a manner as to leave visible neither fissure, mark of impression, nor fracture. For three days the colonel would not consent to trepanning, but on the fourth day, beginning to fall into a stupor, he permitted the operation. It was not performed in vain. Four large pieces were found to have been knocked off the inner plate, and the trephine had to be applied three times before these could be extracted. The colonel recovered perfectly and holds at present a command in the army."[3]

Ravaton[4] describes the case of a grenadier at Philisbourg, who received a contusion from a ball on the anterior part of the right parietal. At Landau, six weeks afterward, he had terrible convulsions, and died. On removing the skull-cap, Ravaton found "la seconde table des os enfoncée et deux dépôts de matière purulente dans la substance du cerveau."

Samuel Cooper[5] trephined at Brussels after the battle of Waterloo, a patient who had been struck on the right parietal bone by a musket ball, with urgent symptoms of compression. "He had not sawn long before the external table came away in the hollow of the trephine, leaving the inner table behind, which was not only fractured but driven at one point more than half an inch into the membranes, and substance of the brain. No sooner were the fragments taken out with a pair of forceps, than the man instantly sat up in his bed, looked around, and began to speak with the utmost rationality. It is a most extraordinary fact that this patient got up and dressed himself the same day, without leave from the medical officers, and never had a bad symptom afterwards."

Baudens, in one of his earlier works,[6] gives the case of a soldier in Algeria, who received a scalp wound apparently over the right parietal. Except paralysis of the arm, there was no indication of affection of the brain. He was bled; but died of acute encephalitis in four days. At the autopsy, Baudens found: "une brisure de la lame vitrée dont une esquille longue d'un demi-pouce s'etait détachée et comprimait le cerveau; le crâne n'offrait à l'extérieur ni félure ni contusion apparente."

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[1] POTT, *Observations on the Nature and Consequences of Wounds and Contusions of the Head.* London, 1760, p. 16, and *Chirurgical Works,* Am. ed. Philadelphia, 1819, Vol. I, p. 170.

[2] BILGUER, J. U. *Chirurgische Wahrnehmungen.* Berlin, 1763, p. 30.

[3] VELPEAU, *De l'Opération du Trepan.* Paris, 1834, p. 29., cites another case from Bilguer, caused by a blow from a brick; but it does not properly belong to this class, as there was an external linear fissure.

[4] RAVATON, *Pratique Moderne de la Chirurgie.* Paris, 1776. T. I, p. 210.

[5] COOPER, *Surgical Dictionary,* 8th ed., p. 899. HENNEN, *op. cit.* p. 327, and BRODIE, in *Med. Chir. Trans.,* vol. XVI, p. 231.

[6] BAUDENS, *Clinique des Plaies d'Armes à Feu.* Paris, 1836, p. 80.

Bernhard Beck[1] relates the case of a soldier of the Pope's second Swiss regiment, who had, at Vincenza, a contusion by gunshot of the right parietal, making a scalp wound two inches long, denuding the periosteum. There was paralysis of the left arm. The patient died two days after the reception of the injury. The internal table was depressed. Four splinters penetrated the dura mater. A collection of pus lay beneath the seat of injury. Beck also gives the particulars of two other cases:[2] that of a man who received a blow on the left parietal from a beer glass, which produced a fracture of the inner table. Meningitis followed by intracranial suppuration and death ensued. The second was a soldier of the Grand Duchy of Oldenburg, who received a lacerated gunshot wound of the scalp over the right parietal. No cerebral symptoms at first; but in three weeks meningitis and pyæmia ensued and the patient died The autopsy showed a fracture with depression of one line of the inner table. The dura mater was separated from the bone, and there was an abscess beneath in the cerebral substance. There were also metastatic foci in the liver and lungs.

Ochwadt[3] records the case of a Danish soldier who received in the Schleswig-Holstein war, an oblique gunshot wound over the left parietal; the scalp being much torn, and the periosteum denuded. There was nothing noticeable about the case until the fifth day. Death resulted on the seventh day from encephalitis. The autopsy showed a depression of the internal table of the size of a *groschen*. Near the upper anterior angle of the parietal, there was a small abscess beneath the cranium and dura mater, at the seat of injury.

Guttenberg[4] records the case of a soldier of the second Baden regiment, who, at Rastadt, August 4, 1861, received a blow from the lock of a musket over the right parietal protuberance. The scalp was torn and the periosteum abraded. He had headache and slight fever, but no cerebral symptons of consequence until August 22d, when convulsions occurred, followed on the 24th by hemiplegia of the right side. Death took place on August 28th. A fracture of the inner table three lines in diameter and depressed one line, without any visible fissure of the outer table, was observed at the autopsy.

Guthrie[5] has carefully examined the literature of this subject, and adds an interesting case which Mr. Dean of Chatteris, in Cambridgeshire, had occasion to observe in a young man—a fracture of the inner table from a blow below the left parietal protuberance. There was a slight detachment of the pericranium, but no external fracture; yet on the removal of the calvaria, when the man died, a few days after the injury, a distinct fracture of the inner table about three-quarters of an inch long, was found corresponding to the external part injured, and extending to the diploë but no further. There was an extravasation of blood beneath, between the bone and dura mater. Guthrie[6] also details a case of injury of the internal table without lesion of the outer, related by Mr. Trye,[7] of Gloucester, successfully treated in the year 1786. Nine weeks after contusion of the right parietal, the external table being evidently dead, the trephine was applied, and he then found that

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[1] BECK, *Die Schusswunden.* Heidelberg, 1850. S. 99, und *Uber isolirten Bruch der Glastafel* in Langenbeck's Archiv. Berlin, 1862, B. 2, S. 547.

[2] BECK, *Kriegschirurgische Erfahrungen.* Freiburg, 1867. S. 167.

[3] OCHWADT, *Kriegschirurgische Erfahrungen.* Berlin, 1865, S. 321.

[4] GUTTENBERG, *Ueber Schädelbrüche mit Eindruck*, in Langenbeck's Archiv. B. IV, S. 596.

[5] GUTHRIE, *Commentaries*, Sixth ed. London, 1855, p. 342.

[6] GUTHRIE, *Op. Cit.—Injuries of the Head, etc.*, quarto. London, 1852, p. 73.

[7] TRYE, *Medical Communications.* London, Vol. II, 1790.

the inner table had been removed by absorption. There were granulations springing up, but whether from the dura or pia mater, or brain, could not be accurately ascertained. This man recovered.

La Motte[1] supposed that when the inner table was broken without the outer, the fact might be ascertained by the peculiarity of the resonance of the skull on percussion resembling the "cracked pot" sound, described in modern times by auscultators of the chest, and cites a case in illustration of this idea. Atthalen of Besançon, had the same opinion, and adduced an interesting case, which happened in 1746; but it appears that in this instance there was a fissure of the external table. Professor Stromeyer[2] also attaches value to this mode of exploration. His remarks on the subject are quoted at length, and possess a special interest, as he reports two of the limited number of cases in which the pathological preparation was preserved:

"This kind of injury, of which only one case has come to my notice, might be observed oftener if we still used the trepan as Pott did, or if one could obtain a reliable diagnosis without opening the cranium. By means of percussing with a silver probe, I was enabled in one case, where there was only a barely perceptible fissure in the outer table, to diagnosticate the extent of the inner separation accurately, and after the decease from pyæmia, in this same case, many of the young surgeons had the opportunity of convincing themselves of the correctness of my diagnosis. Any one of them, who possessed a practiced ear, could discriminate the sounds when percussing the outer table at the point of the internal fracture, or at other parts on the cranium. At the point of the internal fracture, the pitch is somewhat higher. Lanfrancus and Ambroise Paré, I find, already knew of this diagnostic expedient. It is wonderful that the inner table can be fractured and driven inwards considerably, while it is impossible to detect the least injury on the outer table by means of a lens even, as is the case in my specimens. At the same time, these cases are not isolated. Partial fractures of bones by bending are analogous to them. The outer table evidently possesses a greater elasticity and is more pliable than the inner. One can form a good idea of the elasticity of the skull, as Hyrtl says, by throwing a fresh cranium on the floor, when it will rebound. These inner separations remain generally undiscovered, which is, in my opinion, lucky for the patient, because thereby he escapes the danger of being trepanned. It is not assuming too much to suppose that these cases would generally result favorably, if the patient was subjected sufficiently long to an antiphlogistic diet; because the danger incurred by these cases is evidently less than in others, where the access of air to the splintered part of the inner table takes place. For the older surgeons, who did not know the difference between subcutaneous wounds and those exposed to the atmosphere, the lesions in cases of head injuries, formed a constant source of anxiety. They could not explain to themselves what would become of the secretion of the wound. We now know that when the atmosphere is excluded, and proper care is taken, the inflammatory exudation will become reduced to a minimum, sufficient only to permit the healing process; while it will never become so much as to require an exit channel. One need not revert fifteen years in surgical literature to be convinced that an unfounded dread of the impossibility of an exit for the secretions of the wound were then considered proper indications for trepanning. The ample information which one of the most zealous advocates of trepanning, one who was an excellent surgeon as well as a truthful man, I mean Percivall Pott, has given us in regard to the effects of trepanning, leaves no doubt as to the theory that the access of air increases suppuration. In most cases of simple contusions, in which he trephined on account of the formation of pus internally, very little pus was found at the first operation;

[1] La Motte, *Observations de Chirurgie*. T. II, p. 303.

[2] Stromeyer, *Op. cit.*—*Maximen, U. S. V.* Zweite Auflage, S. 331, und 546, und 549.

yet the symptoms were generally aggravated, and trepanning was resorted to a second or third time, and not until the secondary operations were great quantities of pus disclosed. Thus, as usual, one mistake brought about another, and one ill-advised use of the trephine rendered its repetition necessary. The main symptoms which seemed to demand trephining, for the majority of surgeons addicted to the trephine, consisted in the stupor or insensibility of the patient. It really requires no small degree of firmness of conviction of the danger of the trephine to see a patient, not only for days but weeks, in a state of greater or less stupor or insensibility without resorting to the operation, when, sometimes, complete consciousness is restored immediately by a successful elevation of the depressed bone, or the removal of extravasated blood. It is not enough to remind one that patients with typhus often remain for weeks in a still deeper stupor, and yet gradually resume the use of their mental faculties; nor is it sufficient to recall the innumerable cases where trepanning, notwithstanding the apparent success of its purpose of elevating depressed bone, or removing extravasations, did not influence the restoration of consciousness, but where this was only gradually regained by means of an antiphlogistic treatment. One must have observed as often the successful cure of head injuries, without trepanning, to be enabled to acquire such accuracy of observation, as nearly every physician possesses in regard to fever patients. Would not every one be called a miserable quack now-a-days, who would give a typhus patient musk, camphor, or serpentaria on account of stupor? It will not be long before no favorable estimate will be had of any surgeon who will use the trepan on account of comatose conditions alone. The campaigns of 1849 and 1850 have, happily, given many young surgeons the opportunity to convince themselves, with their own eyes, that one may look on a condition of semi-stupor for weeks without resorting to the trepan."

Dr. Stromeyer, in a later portion of his work, figures two examples of this form of fracture and gives the histories of the patients. One was a man who received a gunshot wound of the scalp in Schleswig, April 13, 1849, making a long groove to the left of the sagittal suture. He was sent to Flensburg, the following day. He vomited several times, and was drowsy and complained of headache. His pulse was weak and slow. On April 15th, he was bled, and the venesection, with a saline mixture internally, was repeated on the 17th, and the wound was enlarged and traversed by a crucial incision. On the 18th, erysipelas appeared, and the cold applications employed were replaced by cerate dressings. On the 22d, the swelling and headache had greatly diminished. On the 24th, there was difficult respiration, and the patient was again bled from the arm. He died on the 25th. Blood and pus were found beneath the dura mater.

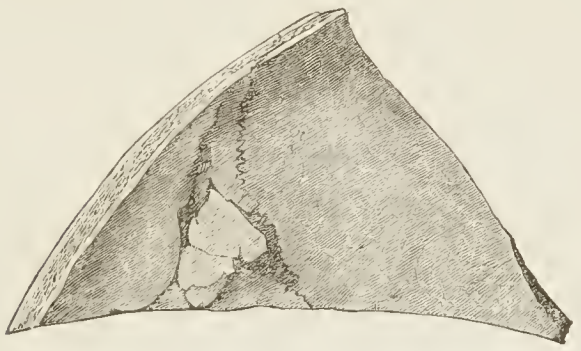

FIG. 63.—Gunshot fracture of the inner table of the left parietal [After STROMEYER, *Maximen*, Fig. 16.]

FIG. 64.—Incipient exfoliation of the outer table of the *os frontis*. [After STROMEYER.]

FIG. 65.—Gunshot fracture of the inner table of the frontal bone. [After STROMEYER.]

Dr. Stromeyer attributes the death to pyæmia. The other case, that of a soldier wounded at Friedericia, July 6, 1849, was fatal in seventeen days. A conoidal ball had grazed the forehead, and had removed the pericranium, but had not fractured the outer table, which showed only the "beginning of a necrosed line of demarcation around the bloodless contused part of the bone;" but the autopsy revealed a portion of the inner table lying upon the dura mater. This patient had no head symptoms for eight days, when there was headache and nausea. He was twice bled and took calomel, and mercurial ointment was rubbed in. On July 20th, there was slight ptyalism. He died on July 23d. Dr. Stromeyer observes that this case proves the inefficacy of antiphlogistics in pyæmic inflammations of the brain. The pathological preparation is represented on the preceding page (FIGS. 64 and 65) as figured in Dr. Stromeyer's work.[1]

There are several other examples of fractures from external violence of the inner table only of the skull in which the pathological specimens have been preserved. One is numbered 29, A, in the Dupuytren Museum.[2] It is the calvaria of a young man who was struck in June, 1848, during the Revolution in Paris, by a musket ball, fired from an upper window of the barracks at Reuilly. There was a furrowed scalp wound over the occipital an inch and a half in length. The skull was denuded, but there was no alteration of color or solution of continuity in the outer table. For a fortnight there were no cerebral symptoms; then ptosis, partial left hemiplegia, and nervous agitation with fever supervened, and on the twenty-fifth day, brain symptoms were so urgent that M. Denonvilliers trephined over the spot struck, evacuated about three ounces of offensive sanguinolent puriform matter, found beneath an oblong detached fragment of the internal table so large that it had to be divided by bone-forceps before it could be extracted through the trephine hole. The patient died from encephalitis six days after the operation.

M. Legouest[3] states that he brought from the French Army in the Crimea an excellent example of this form of fracture, in which adherent fragments of the inner table of the parietal were depressed in a conical form.

Mr. Cowan,[4] Assistant Surgeon of the 55th British Infantry, presented to the Museum at Fort Pitt, a calvarium of a soldier, with a linear fissure of the inner table along the upper edge of the right parietal, the skull having been denuded externally but not fractured.

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[1] Dr. Stromeyer remarks that at the autopsy: "A firm organic connection was observed, of the separated portions of the inner table with the dura mater, which was not even separated by the process of suppuration that had taken place in the neighborhood. This observation seems to prove that such detachments of the inner table need not excite such grave apprehensions as heretofore, since the pieces may retain their connection with the dura mater and do not necessarily assume the character of foreign bodies. Has not Walther proven that the inner table from which a portion has been trepanned can again be restored? A case, of which, Dieffenbach justly speaks as being of great physiological importance. Guthrie did not comprehend Walther's idea of restoration of a trepanned segment, when he says that 'the patient had recovered in spite of his doctor.' The failure in the treatment of my case occurred undoubtedly in the first eight days, during which the patient was said to have been in a good condition. Pott would have undoubtedly trepanned in this case, but what modern surgeon would expect success in a case in which the autopsy revealed an abscess in the liver?" *Op. cit.* S. 546.

[2] *Compendium de Chirurgie Pratique.* T. II, p. 573. This specimen is figured at page 283 of M. Legouest's *Traité de Chirurgie d'Armée.*

[3] LEGOUEST. *Op. cit.* p. 283. I think the specimen is now deposited in the collection at Val de Grace.

[4] See Williamson's *Military Surgery,* p. 29; Holmes's *System of Surgery,* vol. II, p. 47. The patient, Private James Burke, aged 19, received, August 24th, 1855, before Sevastopol, a wound which grazed his head on the side of his scalp, from a musket ball. He walked from the trenches to the field hospital. The bone was found bare, but no fracture or depression could be discovered. There were no general symptoms of serious injury of the head. The scalp was shaved and cold water dressings applied. Five days subsequently the wound became unhealthy and there was slight hemiplegia on the left side. Convulsions and coma followed and death on the thirtieth day after the injury. At the autopsy, the usual signs of meningitis were observed, and a coagulum the size of a walnut was found under the parietal protuberance. The fissure, limited to the internal table, ran parallel to the course of the ball. The specimen is No. 2893, in the Surgical Museum at Netley.

Mr. Prescott Hewett[1] reports, in an analysis of seventy-eight cases of injuries of the head, examined after death at St. George's Hospital, in the decennium from January, 1841 to 1851, that three examples of fracture of the skull, with depression of the inner table alone, were observed. In two, the depression was so slight that it might easily have escaped notice; in the third, the fracture of the inner table was extensive and the depression considerable.

Mr. Edwards,[2] in August, 1862, presented to the Medico-Chirurgical Society of Edinburgh, a specimen of a fracture of the inner table alone of the right temporal bone, from a young lad. The injury was caused by a blow from a cricket ball. There was a slight bruise of the scalp externally, and a crack extending some distance on the internal plate, crossing a canal in which the middle meningeal artery ran. A bit of bone was detached, and the artery was torn across at this point and much blood was extravasated.

Demme[3] states that he saw a case in which a piece nearly two inches square of the vitreous table was detached, by the oblique impact of a musket ball, while the outer table was uninjured, and that he had preserved the preparation.

In a paper on fractures of the skull in Virchow's Archives, Dr. Hermann Friedberg,[4] of Berlin, reports an interesting specimen of fracture of the inner table alone of the frontal, from a sailor boy of seventeen years, who fell through a hatchway into the hold of the vessel.

Bonetus,[5] in his *Sepulchretum*, states that Cortesius had a skull in which the inner table was broken, without any sign of a fracture externally having ever taken place.

These are all of the examples that I have collected of cases of this kind of fracture, in which the pathological preparations were preserved.

It would be possible to glean from ancient authors more examples of this form of fracture, and references to some of them may be found in the foot note.[6] But a sufficient

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[1] *Medico-Chirurgical Transactions.* 2d series, vol. 18. London, 1853, p. 338. The specimen in the third case is preserved, I believe, in the Museum of St. George's Hospital. See the 8th edition of *Cooper's Dictionary*, p. 889.

[2] *Edinburgh Medical Journal.* Vol. 8, part 1, 1862, p. 191. Edinburgh, 1863.

[3] DEMME. *Specielle Chirurgie der Schusswunden nach erfahrungen in den Norditalienischen Hospitaelern von* 1859. Wurzburg, 1861, S. 38.

[4] VIRCHOW. *Archiv für pathologische Anatomie und Physiologie.* Berlin, 1861. B. 22, S. 84.

[5] THEOPHILUS BONETUS. *Sepulchretum sive Anatomica Practica.* Ed. altera by J. J. Mangetus. Folio, Geneva, 1700.

[6] Other cases are reported by SCULTETUS, (*Armamentorum Chirurgicum.* Editio tertia, Hagæ-comitum, 1662, 8vo, p. 212. Obs. XV and XVI,) who describes the injury as "*rima et depressio cranii laminæ interioris, exteriore salva;*" by SOULIER, of Montpelier, in the *Mémoires de l'Académie de Chirurgie,* ed. 1819, T. 1, p. 158; by SALMUTHIUS, (*Observationum Medicarum Centuriæ tres.* Brunsvijæ, 1648, p. 14;) by PLATNER, (*Institutiones Chirurgiæ rationalis.* Lipsiæ, 1758, p. 286;) by BATTING, (*Chirurgical Facts relating to Injuries of the Head.* Obs. VIII;) by SMETHIUS, (*Miscellanea.* Liber X, p. 570;) by DÖRING, (*Nassauische Medicinische Jahrbücher,* p. 308; by KUHK, (*Rust's Magazin,* B. XL, S. 58.) Examples of this form of fracture are ascribed also to ARCÆUS, (*De recta curandorum Vulnerum ratione,* cap. 3, p. 17. Amstelodami, 1658;) to VALLERIOLA, (*Observationum Medicinalium,* lib. 6;) and to BOREL, (*Historiarum et Observationum, Centuriæ* 2, Obs. 20. Frankfort, 1676;) but they do not appear, from the descriptions of those authors to have been fair illustrations. Mr. Guthrie remarks that: "The records of eighteen centuries have produced but little information on this most interesting subject; and if the cases were collected which I have overlooked, as well as those which have been altogether omitted, I apprehend that very little more would be gained. I therefore think it safe and reasonable to come to the conclusion, that although these things have happened, they will rarely occur again. I have never, in the great number of broken heads I have had under my care on many different, and grand occasions, actually known the inner table to be separated from the outer, without positive marks of an injury having been inflicted on the bone or pericranium, however slight that injury may have been; and although it is not possible to doubt the fact of fracture of the inner table having occurred, it is very desirable in a practical point of view not to bear it in mind; for if a surgeon should be prepossessed with the idea that the inner table might be so readily fractured, and separated from the diploë placed between it and the outer table, and thus cause irritation or pressure on the brain, few persons who had received a knock on the head, followed by any serious symptoms, without fracture or depression, would escape the trephine, and the worst practice would be again established. An operation should never then be performed under the expectation that such an accident may have happened, unless it is apparently required by the urgency of the symptoms indicating compression or irritation of the brain, which cannot be relieved by other means."—(*On Injuries of the Head, &c.,* p. 79.)

number of illustrations have been cited, and it will be more profitable to examine the mechanism of this form of fracture, utterly misunderstood until a very recent period.

For centuries it has been taught that this form of fracture took place because of the greater brittleness of the inner table,[1] and this explanation was accepted by the leading surgical authorities until 1865, when the experimental inquiries of Mr. W. F. Teevan,[2] of London, proved that it was erroneous, and demonstrated that the cause of this fracture was not the brittleness of the vitreous plate, and was not to be sought for in any of the reasons heretofore assigned; but that it occurred in obedience to a well known physical law, viz.: That fracture always *commences in the line of extension, not that of compression.*

It can be shown experimentally that violence applied to the inner surface of the skull may produce fracture of the external table only, without any lesion whatever of the inner, and there is at least one pathological specimen in existence illustrating this form of injury.[3] This is conclusive proof that the brittleness and lesser superficies of the inner table has nothing to do with the causation of this form of fracture. Mr. Teevan's explanation is undoubtedly the correct one. He aptly illustrates this variety of fracture by the familiar instance of the cracking of a thin sheet of ice under pressure. Fissures are often seen on the under surface of the ice and none on the upper, and always the crack commences on the under or distal surface. In bending a stick across the knee it begins to break at a point opposite to the spot where the knee is applied, the fracture commencing there in obedience to the physical law that when pressure is applied to a body it will first give way in the line of extension. The annexed diagrams, copied from Mr. Teevan's paper, show the rationale of this form of fracture.[4] As when a stick is bent, the atoms along the proximal curve at which pressure is made are brought near together or compressed, and the atoms along the distal curve

Fig. 1. Fig. 2.

FIG. 66.—Diagrams to show the mechanism of fracture of the inner table of the skull alone. [After TEEVAN.]

[1] Brodie expressed the belief of the English surgeons: "The greater elasticity of the outer table of the skull, and the greater brittleness of the inner table, seem to afford the only reasonable solution of these phenomena." (*Med. Chir. Trans.* Vol. XIV, p. 331.) Vidal de Cassis, (*Pathologie Externe*, T. 11, p. 545,) gives the views of the modern French surgeons: "La table externe percutée, peut résister, tandis que la table interne se fracture immédiatement au-dessous, parcequ' elle est plus cassante, aussi l'a-t-on appelée vitrée." Velpeau, (*De l'Opération du Trépan*, p. 29,) is of the same opinion: "Plus mince, moins étendue en surface, plus irrégulière, plus dense que la table externe, la couche vitrée éclate et se fendille sous un effort manifestement moindre que la précédente." Legouest, (*op. cit.* p. 283,) says: "Lorsque l' os frappé est epais, résistant et à diploë solide, la table interne, plus mince et plus friable que l' externe, se rompt quelquefois, cette dernière restant intacte." The German surgeons had the same view of the causation of this fracture, as indicated in Professor Friedberg's paper in Virchow's Archiv. for 1861. B. Beck, (*loc. cit.*,) who performed many experiments on the dead subject, striking the skull with bullets, and often producing, by oblique impact, fracture of the inner table when the outer was neither depressed nor fissured, believed that the result was due partly to the brittleness of the inner table, and partly to its lesser superficies. He stated that a projectile striking the outer table obliquely, and setting it in vibration, caused a stretching and depression of its tissue; the shorter brittle tabula vitrea following the process, but not quickly enough, was fissured or broken. According to his experiments, the outer table can be depressed from half a line to one line without breaking. It may be asserted that all surgeons, prior to Mr. Teevan, assigned as the cause of this fracture the greater brittleness of the inner table, and that Dr. Beck gave as an additional explanation its shortness.

[2] TEEVAN. *British and Foreign Medico-Chirurgical Review.* Vol. XXXVI, p. 189. London, October, 1865.

[3] Specimen 1082 ^{70}, in Guy's Hospital Museum, is the calvarium of a suicide, who shot himself in the right temple. The pistol ball traversed the brain and struck the inside of the left portion of the frontal bone, and remained within the skull. At the point of impact there is a black mark, but no fissure or fracture; but at the corresponding point outside is a starred fissured fracture of the outer table only.

[4] I quote Mr. Teevan's explanation of the diagrams: "Let A B, Fig. 1, be a section of the skull. Draw two vertical lines, C E, and D F, parallel to one another. Now, if pressure be applied at G, temporary depression takes place, and the bone assumes the shape of H K, Fig. 2, and the lines C E, D F, are no longer parallel to each other, but converge towards each other at the upper surface I L, J M, so that the distance from I to J is less than that from C to D, but the distance from L to M is greater than

are extended, or separated, and when the stick breaks, the rent begins at the spot in the distal curve where the extension is greatest, and opposite to where the pressure is made; so when violence is applied to the external vault of the cranium, insufficient to cause complete fracture, yet depressing the bone enough to cause partial fracture, the solution of continuity will always be in the inner table opposite the part struck.

I have satisfied myself, by a large number of experiments, of the accuracy of Mr. Teevan's conclusions. I have had no difficulty in producing, by slight blows with a hammer upon the outer or inner surfaces of calvaria, fissures or stellated fractures of the outer table only or of the inner table only.[1] In some of my experiments, portions of the vitreous table were detached without visible injury to the outer table; but in striking the inside of the skull, I was able to make fissures only in the outer table without injuring the inner. Dr. Beck's opinion that fracture of the inner table of the skull alone only in those parts where there is but little diploë is erroneous. It generally occurs, in cases resulting from accident, in parts of the skull where the diploë is abundant, and can there be more readily produced experimentally. The explanation offered in the Surgical Report of 1865, from this Office,[2] of the causation of this form of fracture is imperfect. It is true that the fracture often results "from a small projectile striking the cranium very obliquely," or sometimes, as Legouest suggests, from a "comparatively slight blow from a body with a plane surface." But it is the force and not the direction of the violence to the exterior of the skull that is the essential point. A spent bullet, striking at right angles, may produce this fracture. If moving at a high rate of velocity, it will fracture both tables, or penetrate or perforate the skull. It is because the ball which glances, or strikes slantingly, acts with but little force at the point of impact that it is the frequent cause of this injury. In the many cases in which I produced it experimentally, I hit the skull at right angles with moderate force, with a hammer a half inch in diameter at the face.

It cannot be doubted that many cases of this form of injury terminate favorably, and are never recognized. It is obvious that the diagnosis must always be obscure. The accident may lead to a fatal result in various ways; either by causing contusion of the brain, or a laceration of its membranes or substance by the jagged edges or detached spiculæ of the vitreous table; or else by these same causes leading to acute or chronic

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that from E to F, signifying that the atoms of bone in the upper surface from I to J have been brought nearer to each other, or compressed, whilst the atoms of bone in the lower surface, from L to M, have been extended or separated from each other; therefore, if any fracture take place, it is clear it must do so in the line of extension L M, and at that point in the line where the greatest extension is going on, which is at N, exactly opposite the spot O, where the pressure was applied.

Proof: Take a cane slightly bent, say A B, Fig. 1, and insert two pins or wires, C E, D F, vertically, and parallel to each other, the more the pins project at each surface the more manifest will be the result. Exert pressure at G till the cane is made flatter, H K. It will now be found that the wires are no longer parallel to each other, but converge along the upper surface, so that the distance between them from I to J is less than that from C to D, but the distance from L to M is greater than that from E to F, showing clearly that the atoms along the line I J have been compressed and brought nearer to each other, whilst those along the line L M have been extended; consequently, if any fracture takes place, it must commence at N. If the pressure on the cane be continued till it breaks, it will be found that it commences to break at the point N."—TEEVAN, (*op. cit.* p. 194.)

[1] BRUNS, (*Handbuch der Practischen Chirurgie.* Tübingen, 1854, B. 1, S. 297,) who has devoted much attention to this subject, says that only once was he able to cause, by a blow with a round hammer on the convexity of the skull, a fracture of the inner table alone. But if the directions of Mr. Teevan are followed, any one, with a little practice, may produce such fractures at will. The following is his method: "A skull-cap, stripped of all its soft parts, with a wet cloth inside of it, is to be laid with its convexity in the palm of the left hand, which is to be protected with several layers of moist cloth, to obviate an inconvenient amount of pain. If the inside of the skull be now struck by the hammer with a slight degree of force, fracture of the external table will be produced without any fracturing or fissuring of the inner."—TEEVAN, *op. cit.* p. 193.

[2] CIRCULAR No. 6, *War Department, Surgeon General's Office, Washington, November* 1, 1865. *Reports on the Nature and Extent of the Materials available for the preparation of a Medical and Surgical History of the Rebellion.* Printed for the Surgeon General's Office. By J. B. Lippincott & Co., Philadelphia, 1865, p. 12.

encephalitis; or producing compression of the brain; or by the line of fracture crossing the course of the middle meningeal artery, and producing, if this should happen to be enclosed in a bony canal, a fatal intracranial extravasation. The most common immediate cause of death is compression from abscess in the vicinity of the injury.[1]

It is evident that the treatment of this form of injury must be determined by those principles which guide us in treating scalp wounds, contusions of the cranial bones, concussion and compression of the brain. When symptoms of compression are urgent and persistent, and especially if there is paralysis of the side opposite to the seat of injury, the application of the trephine is undeniably justifiable. In at least four cases, reported by Mery, Bilguer, Samuel Cooper, and Trye, recovery took place after trephining, the operation having been attempted in eleven only of the cases I have cited.

GUNSHOT FRACTURES OF BOTH TABLES OF THE SKULL.—The cases of this class reported during the war were so numerous, that it is practicable to present only abstracts of some of the more interesting examples of each variety or subdivision, with brief notes of others, supplemented by numerical tabular statements of the whole number returned.

Linear or Capillary Fissure.—Nineteen cases of gunshot fracture of the skull, twelve of which had a favorable, and seven a fatal issue, were reported under this head. On reviewing the histories, I am not satisfied with the correctness of diagnosis in any of them. In four of the fatal cases, autopsies were made; and injury to the membranes or substance of the brain were found in each, and in two, very marked depression of the vitreous table. The following is an abstract of one of the cases:

CASE.—Corporal William Barthaul, Co. D, 45th New York Volunteers, aged 35 years, was wounded, at the battle of Gettysburg, Pennsylvania, July 1st, 1863, by a conoidal ball which produced a wound of the scalp about an inch in length, over the left occipital region. He remained in the field hospital until the 11th of the month, when he was transferred to the Turner's Lane Hospital at Philadelphia. The wound was suppurating slightly. He improved steadily until the 23d, when the parts in the region of the wound became highly inflamed, creating considerable sympathetic fever. Flaxseed poultices were applied, and by the 27th the wound suppurated freely. Milk punch was now given during the day, the diet otherwise being restricted. The patient became prostrated, and on the 2d of August, was attacked with a slight delirium. Death followed on the 6th of August, 1863. At the autopsy a fissure of the occipital bone was discovered, one and a half inches in length, involving both tables. About one ounce of purulent matter surrounded the line of fracture outside of the dura mater. The case is reported by Acting Assistant Surgeon David Burpee.

In the Army Medical Museum there are few examples of capillary fissure from gunshot, except those which have been referred to in the discussion of fractures of the inner table alone; but good illustrations of this form of injury, as described by systematic authors, but caused by falls or blows, are furnished by specimens 130, 2970, and 2876, Section I, figured at pp. 38, 43, and 49, of this work. Specimens 393 and 2492, furnish the nearest approximation to this form of fracture produced by gunshot. In both cases there is linear fissure with very slight depression of the inner table:

CASE.—Private Francis B———, Co. A, 10th Vermont Volunteers, aged 40 years, was wounded in one of the engagements at the crossing of the Rapidan River, Virginia, in May, 1864, in the forehead by a gunshot missile, probably a musket ball, which caused only very little external injury. He was admitted to the Baptist Church, 3d division, Sixth Corps Hospital, at Fredericksburg, thence conveyed to Washington, and admitted May 26th into the Lincoln Hospital, being then

[1] Mr. TEEVAN asserts (*op. cit.* p. 198) that: "There are two cases in which the diagnosis may be made with almost certainty. Firstly, when a person recovers immediately after the blow, but finds there is paralysis of some part of the body opposite to the side struck, and examination fails to detect any injury to the bone. Secondly, when, after the blow, no evil consequences arise at first, but in the course of time the patient begins to complain of fixed pain in the part struck, and all the symptoms of chronic cerebral irritation show themselves, although the surgeon cannot find any injury to the external table."

extremely prostrated. No serious injury to the head was suspected, but an attack of typhoid fever was anticipated, the tongue being somewhat coated. The intellect was unimpaired. He seemed to improve and was soon able to leave the ward. He continued so for two or three days when he again took to his bed, complaining of slight pain in the head, but manifesting no aberration of mind. Coma and subsultus tendinum supervened; discharge of blood and pus from the right, and pus only from the left, ear occurred, and death ensued on June 6th, 1864. At the autopsy a slight linear fissure of the frontal bone was observed, and on removing the calvaria a fracture of the internal plate and necrosis to the extent of three-fourths by one and a fourth inches was found to exist; including within its limits part of the posterior wall of both frontal sinuses, in which some half a drachm of pus had formed. The brain in the region of the fracture was softened. The adjoining wood-cuts (FIGS. 67 and 68) shows the linear but slightly depressed fracture which existed over the right superciliary ridge, and a portion of the fragment of the internal table which was detached. The frontal sinuses are unusually capacious; the walls are very thin. The specimen and notes of the case were contributed by Assistant Surgeon J. C. McKee, U. S. A.

FIG. 67.—Section of the frontal bone showing a linear fracture over the right superciliary ridge. *Spec.* 2492. Sect. I, A. M. M.

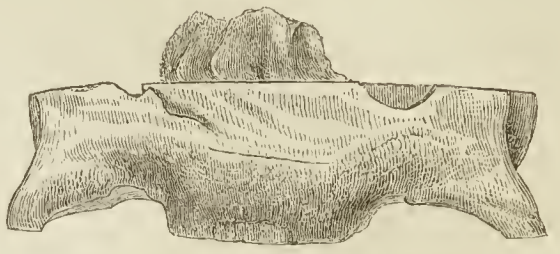


FIG. 68.—Exterior view of the foregoing specimen.

Specimen 393 represents a dense, heavy and rather thin calvaria with a gunshot contusion near the right frontal eminence, and near it a linear fissure of both tables. But it appears quite probable that this fissure was produced in removing the skull cap, as not infrequently happens in using a chisel as a lever after sawing the bone:

CASE.—Private H. S. L———, Co. A, 35th Massachusetts Volunteers, aged 21 years, was wounded at the battle of South Mountain, Maryland, September 14th, 1862, by a round musket ball on the right side of the frontal bone, at a point about one and a half inches anterior to the coronal suture, producing apparently only a scalp wound. He was conveyed to the Newton University Hospital, Baltimore, on the 20th of the month. The wound looked healthy, and the patient was free from pain in his head. On the 25th, secondary hæmorrhage occurred from a small branch of the temporal artery which was promptly arrested by division and the application of a compress for a few hours. The case progressed favorably until the 6th of October, when a state of low muttering delirium supervened. When spoken to the patient would become conscious for a few moments, but would immediately relapse into a comatose state which continued until the 9th when death resulted. At the autopsy the meninges gave evidence of a low degree of inflammation over a surface two inches in diameter. A few drops of pus were discovered upon the surface of the brain. The pathological specimen is No. 393, Sect. I, A. M. M. The frontal bone is contused one inch externally to the right of the frontal eminence with a fissure one inch in length running downward. There is a stellate fracture of the inner table with slight depression, the longest fissure being two inches in length. Two small wart-like exostoses existed near the centre of the frontal bone, one on either side of the groove for the longitudinal sinus. The specimen and history were contributed by Acting Assistant Surgeon J. H. Currey.

Specimen 1951 shows linear fissures of the inner table beneath a necrosed portion of the outer plate, which appears to be slightly depressed. But it is difficult to decide whether this case should be referred to this category or to the one immediately preceding:

CASE.—Sergeant Ross D———, Co. B, 19th Massachusetts Volunteers, was wounded in the engagement at Bristow Station, Virginia, October 14th, 1863, by a conoidal ball which struck near and external to the left frontal eminence, slightly depressing the external and fissuring the internal table. He was admitted to the hospital of the 2d division, Second Army Corps, and on October 19th was sent to Lincoln Hospital, Washington. No cerebral symptoms existed for some time after admission. On November 6th, hæmorrhage, which was arrested by ligation, occurred from the anterior temporal artery. Hæmorrhage recurred on November 20th, and on the following day the wound became gangrenous. The patient grew comatose and died on November 29th, 1863. At the autopsy the external table was found necrosed, the diploë was filled with fungous granulations. The dura mater was indurated beneath the injured spot, although no evidences of inflammation were present. On removing the brain a large quantity of thin pale serum was found in the subarachnoid space. A large abscess existed in the anterior of the left hemisphere just beneath the seat of injury, extending into the lateral ventricle, filled with thick, sanious and fœtid pus. The right ventricle was normal, The pathological specimen is figured in the cut (FIG. 69.) The inner table of the cranium presents a T-shaped fissure without depression, and is spongy. A thin plate of bone one inch in diameter is necrosed on the external table, and the adjacent osseous tissue is porous and cribriform. The specimen was contributed by Assistant Surgeon H. Allen, U. S. A.

FIG. 69.—Linear fissure of the inner table of the skull. *Spec.* 1951, Sect. 1, A. M. M.

Gunshot Fractures of Both Tables of the Cranium Without Depression.—A number of instances of fractures of both tables of the skull were reported in which the evidences of injury to the bone were so slight that they were not recognized until after death. The following are good illustrations:

CASE.—Private William A———, Co. F, 11th Pennsylvania Volunteers, aged 29 years, was wounded at the battle of the Wilderness, Virginia, May 7th, 1864, by a conoidal ball which struck the frontal bone between the eminences, lacerating the muscles for about two inches and denuding the bone of periosteum for about one inch. The wound was considered slight. The patient was treated for several days in a field hospital, and on May 11th was sent to the Lincoln Hospital, at Washington, whence on May 18th, he was transferred to the Satterlee Hospital, Philadelphia. Cold water dressings were applied to the wound and the patient was able to be about all the time. He was in good condition and appeared to do well until May 31st, when he became irritable, and complained of severe pain in the head. The external wound still looked well. On the following day he became drowsy and suffered from nausea. The pain in the head continued unabated and the pulse was 110, but the mind clear. Small doses of creasote and lime-water were given and he was freely purged. On May 24th the nausea subsided and the pulse had risen to 120; no pain in the head, and the patient was rational though dull. On the 25th the pulse was weak at 130, but the patient seemed perfectly conscious, and his mind was clear, and he declared that he felt perfectly easy, yet he died suddenly at five in the afternoon. This is the report of Acting Assistant Surgeon J. K. Baldwin, yet his ward case book states that the patient survived until the 26th, having low muttering delirium in the early part of that day. The autopsy was made forty hours after death by Acting Assistant Surgeon Charles P. Tutt. He reported that though the periosteum was removed the external table of the skull was scarcely injured, except by a shaving of lead from the ball firmly imbedded beneath the outer lamina at the inner upper margin of the wound in the periosteum. On removing the calvaria a large amount of pus was found upon the dura mater of the anterior lobe of the left hemisphere beneath the seat of injury. On removing the pus a spiculum of bone from the inner table was found to perforate the dura mater and a large abscess extending into the anterior horn of the left lateral ventricle was found beneath. A large effusion of serum was found at the base of the brain, and a yellow deposit was found on the pons Varolii and medula oblongata and in the fissures of the cerebellum. A similar deposition of albuminous or puriform matter was also found under the arachnoid near the left ventricle. The viscera of the chest and abdomen were in a normal condition. The clinical history was furnished by Acting Assistant Surgeon J. K. Baldwin, who is also accredited with the specimen, of which an external and internal view is given in the accompanying wood-cuts, (Fig. 70, and Fig. 71.) The notes of the autopsy were furnished by Acting Assistant Surgeon Tutt who made it. In the external table a portion of bone measuring one-fourth by one inch, a small fragment of which is depressed one line and surrounded by a slight groove, indicated an incipient exfoliation. At the upper inner portion of this oval groove a bit of lead is impacted. The inner table beneath is fissured for one inch beneath the seat of injury.

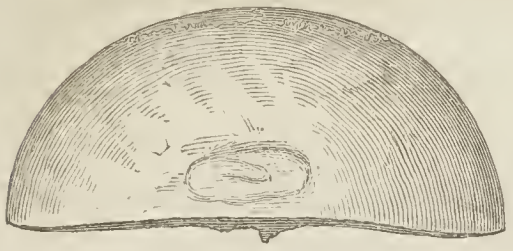


FIG. 70.—Contusion and slight fracture of the frontal bone by a glancing musket ball. *Spec.* 2744, Sect. 1, A. M. M.

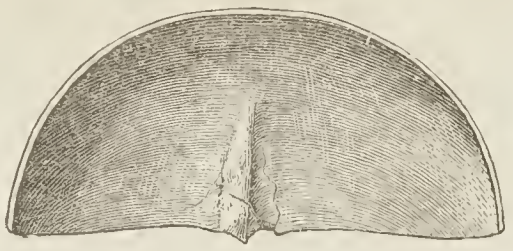


FIG. 71.—Interior view of the foregoing specimen.

CASE.—Private George W. B——, Co. A, 10th Pennsylvania Reserves, was wounded at the battle of Fredericksburg Virginia, December 13th, 1862, by a canister shot which tore the scalp for an inch in extent over the left parietal bone, just behind the coronal suture. He was conveyed to Washington, D. C., and next day was admitted into the Stanton Hospital. The injury was regarded as slight, there being no evidence that the bone or structures beneath were seriously involved. With the exception of a slight headache, the case progressed well until the morning of the 22d, when he was seized with violent pain in the head in the vicinity of the wound. He became restless and painfully sensitive to sound. On the evening of the 23d, and again on the morning of the 24th, chills supervened, attended with delirium. A few hours later insensibility of the right side of the body was noticed. A blister was applied over the nucha, and free purgations produced by cathartics. In the afternoon the patient was rational, and full sensibility in the body was restored. The chills being regarded of a malarious character, liberal doses of quinine were administered, and none occurred after the 25th of the month. On the 30th he fell into a semi-comatose state, and death ensued on the 4th of January, 1863, no convulsions having occurred at any time. The autopsy revealed a circular depression of the external table of the left parietal bone, just behind the coronal suture, half an inch in diameter, the surrounding bone being cribriform. The inner table was found irregularly fissured and depressed half a line. About an ounce and a half of a sanguine, purulent fluid had collected between the dura mater and the cranium. The brain itself, however, appeared healthy. The pathological specimen is No. 628, Sect. 1, A. M. M., and was contributed, with the history, by Surgeon John A. Lidell, U. S V. It is quite remarkable to observe that several of the fragments of the vitreous plate are very firmly re-united, the patient having survived the injury only twenty-three days.

A musket ball impinging obliquely upon the vault of the skull, will occasionally detach a portion of the calvaria, an inch or more in its diameter, without any depression of the margins of the solution of continuity thus produced in the cranial bones. A patient

who presented a remarkable illustration of an injury of this description is represented in the plate opposite. The history of the case is as follows:

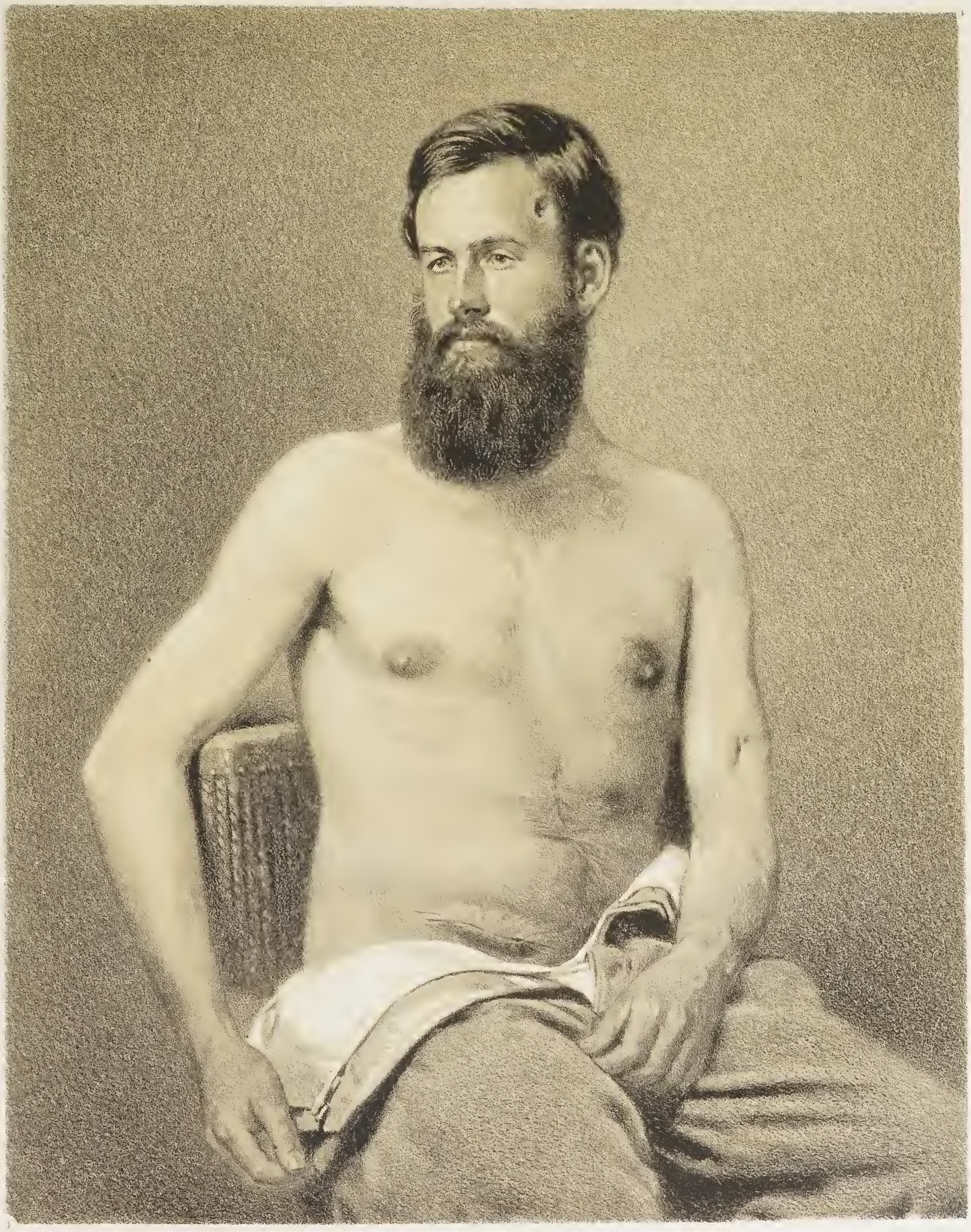
Case.—Private Edson D. Bemis, Co. K, 12th Massachusetts Volunteers, was wounded at Antietam by a musket ball which fractured the shaft of his left humerus. The fracture united kindly, with very slight angular displacement and quarter of an inch shortening. Promoted to be corporal, Bemis received May 6th, 1864, at the battle of the Wilderness a wound from a musket ball in the right iliac fossa. He was treated in the Chester Hospital, near Philadelphia. There was extensive sloughing about the wound, but it ultimately healed entirely, leaving a large cicatrix, parallel with Poupart's ligament. Eight months after the injury, Bemis returned to duty with his regiment. On February 5th, 1865, Corporal Bemis was again severely wounded at the engagement at Hatcher's Run, near Petersburg, Virginia. Surgeon A. Vanderveer, 66th New York Volunteers, reports that the ball entered a little outside of the left frontal protuberance, and passing backward and upward, removed a piece of the squamous portion of the temporal bone, with brain substance and membranes. When the patient entered the hospital of the 1st division of the Second Corps, brain matter was oozing from the wound. There was considerable hæmorrhage, but not from any important vessel. Respiration was slow; the pulse 40; the right side was paralyzed and there was total insensibility. On February 8th, the missile was removed from the substance of the left hemisphere, by Surgeon Vanderveer. It was a conoidal musket ball, badly battered. The patient's condition at once improved. He told the surgeon his name, and seemed conscious of all that was going on about him. Water dressings were applied, and an ingeniously arranged sponge absorbed the discharge from the wound. He was kept on very light diet and remained very quiet for ten days, answering direct questions, but indisposed to continue a conversation. He had no convulsions and his sleep was not disturbed by delirium. About February 18th, a marked improvement was manifest. The patient conversed freely, and the wound was rapidly cicatrizing, and the hemiplegia had entirely disappeared. On February 28th he was able to walk about the ward. On March 18th the wound was nearly healed. The patient was sent northward on a hospital transport to Fort Richmond, New York Harbor. He recovered perfectly, and in May was furloughed, and on May 18th he wrote to Dr. Vanderveer, that he was doing well at his home in Huntington, Massachusetts, suffering only slight dizziness in going out in the hot sun. In July he went to Washington to apply for a pension, and entered Campbell Hospital. He was discharged on July 13th, 1865, on surgeon's certificate of disability. At this date he was photographed at the Army Medical Museum. The wound in the head was then nearly healed. There was a slight discharge of healthy pus from one point. The pulsations of the brain could be felt through the integument. The mental and sensory faculties were unimpaired. The corporal had been discharged from service and recommended for a pension. The plate opposite is a very accurate copy of the photograph, which is numbered 58 of the surgical series, A. M. M. Mr. Bemis was pensioned at eight dollars per month. On October 30th, 1870, he wrote to the editor of the surgical history from his home in Suffield, Connecticut, as follows: 'I am still in the land of the living. My health is very good considering what I have passed through at Hatcher's Run. My head aches some of the time. * * I am married and have one child, a little girl born last Christmas. My memory is affected, and I cannot hear as well as I could before I was wounded.'

The five following cases were of a somewhat similar nature, though the ulterior results were less satisfactory:

Case.—Private William B. Brock, Co. B, 110th Ohio Volunteers, aged 32 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball, which struck about two inches to the left of the median line and anterior to the coronal suture, passed backward along the sagittal suture, fracturing the external table of the left parietal bone, and emerged about two inches from the point of entrance. He was admitted to the hospital of the 3d division, Sixth Corps; on June 7th, was sent to the Lincoln Hospital at Washington; on June 18th, was transferred to the Summit House Hospital, and on October 7th, to the Satterlee Hospital, Philadelphia. The wound had healed, but the patient was nervous and could not bear the heat of the sun; the vision of the right eye was impaired, and the right arm was nearly useless. He was discharged on February 9th, 1865, and pensioned. On September 24th, 1867, Pension Examiner W. S. Parker reported that the wound, which, it seems, resulted in exposing a portion of the brain, was about a year in healing; the patient is unable to bear exposure to the sun or heat, and suffers from vertigo. His disability is rated total and doubtful.

Case.—Private George W. Bowen, Co. E, 59th Illinois Volunteers, aged 21 years, was wounded during the siege of Nashville, December 9th, 1864, by a conoidal musket ball, which fractured the right parietal bone, carrying away a piece one inch and a half in length by nearly an inch in breadth. On the same day he was admitted to the hospital of the 3d division, Fourth Corps, and transferred as follows: On December 12th, to Hospital No. 13, Nashville; January 5th, 1865, to Jefferson Hospital, Indiana; and on March 22d, to the Marine Hospital, St. Louis, Missouri, where he was discharged from service on April 18th, 1865. His memory was much impaired, and his gait unsteady. He was pensioned, his disability being rated total and permanent.

Case—Private Henry Cook, Co. G, 1st Ohio Volunteers, aged 23 years, was wounded at the battle of Resaca, Georgia, May 15th, 1864, by a conoidal musket ball, which produced a limited fracture of the skull without known depression. He was admitted to the hospital of the 3d division, Fourth Corps, and on May 23d was conveyed to the field hospital at Chattanooga; thence was sent to the Cumberland Hospital at Nashville on May 26th. He was furloughed in August, with orders to report at the expiration of his leave to the Medical Director. On August 23d, 1864, he was discharged the service and pensioned. Pension Examiner C. J. Neff reported on February 22d, 1868, that a portion of the skull has been removed, leaving the brain exposed. There is partial loss of memory, constant headache, paralysis of superior extremities, subsultus, etc. He rates his disability as total and permanent.



Case.—Private Elias Hess, Co. C, 199th Pennsylvania Volunteers, aged 18 years, was wounded in an engagement before Petersburg, Virginia, April 2d, 1865, by a conoidal musket ball, which fractured the right side of the frontal bone. He was admitted to the hospital of the Twenty-fourth Corps, and on April 5th was sent to the hospital at Fort Monroe. Application of simple dressings constituted the treatment. On May 17th, he was transferred to the McClellan Hospital, Philadelphia, and on July 10th, 1865, he was discharged the service. In July, 1868, he was a pensioner, his disability being rated one-third and permanent, by Dr. F. F. Burmeister, the pension examining surgeon.

Case.—Corporal August Buhlmeier, Co. B, 20th New York Volunteers, was wounded at Antietam September 17th, 1862. A portion of the frontal bone, left side, had been fractured and partly torn away, leaving the brain exposed for a space of two inches by one inch. He was taken prisioner, afterward paroled, and on November 15th, was admitted to Hospital No. 1, Annapolis, whence he was discharged the service, March 13th, 1863, being unable to undergo either mental or physical exertion. He was pensioned, his disability being rated three-fourths and permanent, by Pension Examining Surgeons Meagher, Treadwell, and Fergusson.

Similar lesions were produced by fractures from shell fragments:

Case.—Private George W. Washabaugh, Co. G, 100th Pennsylvania Volunteers, aged 22 years, was wounded at James Island, South Carolina June 16th, 1862, by a fragment of shell, which fractured the superior border of the right parietal bone, carrying away an inch and a half in dimension, and lacerating the dura mater. The wound healed in four months, when violent convulsions, followed by insensibility, supervened. He was discharged October 9th, 1862, and pensioned. On September 3d, 1866, Pension Examiner J. P. Hosack reported that a portion of the skull, three inches in length by one in width, has been removed; that the patient suffers from constant pain in the head and from partial paralysis of one arm; and that, when excited, he is subject to convulsions. His disability is rated total and, probably, permanent.

Case.—Private William P. Dean, Co. D, 8th Pennsylvania Reserves, was admitted to Hospital at Upton's Hill, Virginia, with a gunshot fracture of the skull, caused by a fragment of shell. He was discharged the service March 7th, 1863, and pensioned. On February 3d, 1868, Pension Examiner F. C. Robinson reported that the patient has an opening through the skull at the vertex nearly one inch long and one-fourth of an inch wide, and that he complains of headache, vertigo, and dimness of vision, which were aggravated by hard labor or exposure to the vicissitudes of the weather. His disability is rated one-fourth and permanent.

Examples will be given hereafter of the splitting of bullets upon the cranial bones. There are instances, however, which will more properly find a place here, in which a bit of lead is clipped off, and fissure with very trifling depression produced, as in the following case:

Case.—Corporal William E. S———, Co. F, 84th Pennsylvania Volunteers, aged 25 years, was struck at the battle of the Wilderness, May 5th, 1864, by a musket ball on the forehead, a little to the left of the median line. He was taken to the third division field hospital of the Second Corps, and was thence sent to City Point, and transferred on a hospital transport to Washington, and on May 16th admitted to Mount Pleasant Hospital, Washington, D. C., and on May 27th sent to Chester Hospital, Pennsylvania. The wound was discharging sanious matter, and was much inflamed and painful. There was considerable fever, which increased on the 29th. On the following day the patient became delirious, and died on May 31st, 1864, from meningitis. The pathological specimen, which is represented in the adjoining wood-cuts, (Fig. 72 and Fig. 73,) consists of the body of the frontal bone, with a fragment of lead impacted near the centre and to the left of the median line. An ovoid plate of the external table, measuring one by two inches, is slightly discolored, and surrounded by a groove of demarcation, external to which the bone is cribriform. A plate of the inner table, measuring one square inch, is detached by three of its sides, and driven inward to the depth of two lines at its free edges. Two fissures, each one and a fourth inches in length, run backward and outward, and there is a slight deposit of new osseous material on the inner surface. The specimen was contributed by Surgeon T. H. Bache, U. S. V.

Fig. 72.—Exterior view of a frontal bone contused by a bullet, and having a fragment of lead impacted under the outer lamina. *Spec.* 2523, Sect. I, A. M. M.

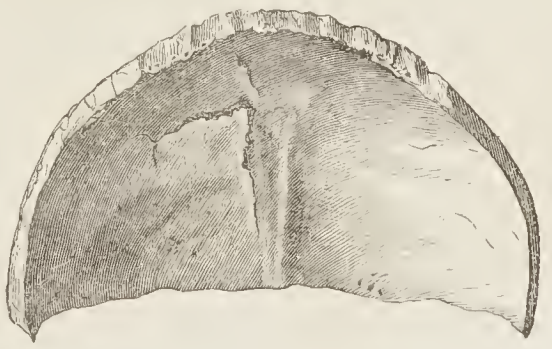


Fig. 73.—Interior view of the preceding specimen, showing the depression of the vitreous table.

The next two abstracts refers to very similar cases:

Case.—Private Allen Harrison, Co. L, 2d New York Mounted Rifles, aged 34 years, was wounded in an engagement before Petersburg, Virginia, July 8th, 1864, by a conoidal musket ball, which struck the frontal bone in the upper portion, causing two slight fissures, small portions of lead remaining imbedded in the outer table. He was admitted to the hospital of the 2d division Ninth Corps, and on July 16th was sent to the Mower Hospital, Philadelphia. On July 24th, a severe attack of acute pleuritis was followed by symptoms of hepatitis. His respiration became short and labored, and the conjunctivæ and skin

tinged with yellow; the tongue was dry and coated, and he complained of severe pain in the liver. A blister plaster was applied to the side of the chest; and squills and solution of morphia and stimulants prescribed; but he sank rapidly and died on July 28th, 1864. Upon removing the calvaria at the autopsy, an abscess was found directly under the point of injury, over the longitudinal sinus, containing half an ounce of dark green offensive pus. The dura mater was much thickened, but there was little evidence of congestion of the brain. The liver was pale. One pint of serum was found in each side of the pleural cavity. There had been inflammation of the lower lobe of the right lung. Symptoms of compression, if present, were so masked by pleuritic and hepatic indications as to escape notice. Acting Assistant Surgeon W. P. Moon, reported the case from notes furnished by Dr. Fell, and subsequently published an abstract of it in an article on gunshot wounds of the head, in the *American Journal of the Medical Sciences* for July, 1866, and fuller data have been derived from the hospital registers.

Case.—Private A. Stanton, Co. G, 1st New York Dragoons, received, at the battle of Winchester, Virginia, September 19th, 1864, a gunshot wound of the head. The skull was fractured from the right orbital arch upward and inward about three inches. A bit of the conoidal musket ball which inflicted the injury was chipped off by the outer table of the frontal. He was admitted to the Cavalry Corps hospital on the following day. The patient was at times partially conscious, and suffered from pain in the head and irritative fever. The functions of the body were normal, but he became very emaciated, sank gradually, and died, without convulsions, October 16th, 1864.

In the following cases the ball lodged in the diploë or sinuses:

Case.—Private Jacob Miller, Co. K, 9th Indiana Volunteers, aged 25 years, was wounded at the battle of Chickamauga, September 19th, 1863, by a buck-shot, which penetrated and lodged in the frontal bone near the nasal eminence, causing fracture of the left orbit and exophthalmia of the eye. On the same day he was admitted to hospital No. 5 at Nashville, and on October 20th was transferred to No. 13, Louisville, whence he was transferred on the 25th to New Albany, Indiana, and thence on March 19th, 1864, to the hospital at Madison, Indiana. The missile was extracted on June 15th, 1864, and expectant treatment only was used. The patient, recovering, was transferred to Indianapolis September 2d, 1864, to be mustered out of service, and was discharged September 17th, 1864, and pensioned. On August 17th, 1868, Pension Examiner A. Coleman reports the patient suffering from caries of the frontal bone, attended with purulent discharge, loss of power in left eye, general disturbance of the mental faculties, which are aggravated when the wound discharges much, and at times complete prostration. A subsequent report from Pension Examiner J. K. Bigelow, dated January 7th, 1870, confirms previous statement of patient's condition, and rates his disability as total and permanent.

Case.—Private Charles R———, Co. K, 51st New York Volunteers, aged 22 years, was wounded, at the battle of New Berne, North Carolina, March 14th, 1862, by a conoidal musket ball, which struck obliquely above the right frontal sinus. The ball split upon the outer table, and the larger portion of it passed under the occipito-frontalis tendon, and the remainder was impacted in the sinus. The patient was conveyed in an ambulance to New Berne, and entered the Academy Green Hospital. The portion of ball which lodged under the aponeurosis was extracted. Cold water dressings were applied, and the case was treated on the expectant plan. Symptoms of compression of the brain soon supervened; yet the patient survived until October 25th, 1862. At the autopsy it was found that there was an abscess of the brain, and that a fracture with depression passed through the right frontal sinus. The external opening measuring three-fourths of an inch in length, and one-third of an inch in width, with edges rounded by the commencing repair. One and a half square inches of the inner table are depressed half an inch. The fragment of ball which penetrated the frontal sinus projects slightly into the cranial cavity to the left of the longitudinal ridge of the *os frontis*. The specimen was sent to the Army Medical Museum from New Berne, and is represented in the accompanying wood-cuts, (Fig. 74, and Fig. 75,) and was accredited to Surgeon C. A. Cowgill, U. S. V.; but Dr. Cowgill verbally informs the editor that he has no recollection of the case or of the specimen. The specimen is a very interesting one, and was probably sent to the Surgeon General's office by one of the assistants at the Academy Green Hospital, without the name of the donor, and only the brief memorandum, the chief points of which are recapitulated above.

Fig. 74.—Section of the frontal bone with a fragment of ball embedded in the frontal sinus. *Spec.* 546, Sect. I, A. M. M.

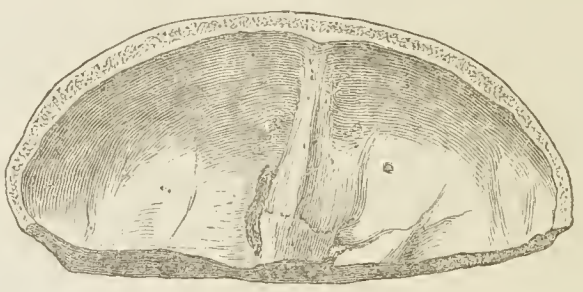


Fig. 75.—Interior view of the preceding specimen.

Case.—Private John D. Clark, Co. I, 53d Ohio Volunteers, aged 18 years, was wounded near Resaca, Georgia, May 25th, 1864, by a conoidal ball, which fractured the frontal bone above the right eye, and lodged. On May 29th, he was admitted to hospital at Chattanooga, Tennessee, and was transferred as follows: on June 2d, to hospital No. 1, Nashville; June 5th, to Joe Holt Hospital, Jeffersonville, Indiana; June 24th, to Camp Dennison, Ohio; July 15th, to Cleveland, Ohio; August 10th, to Crittenden, Kentucky, and on October 7th, to Seminary Hospital, Columbus, Ohio. He was discharged December 13th, 1864, and pensioned. Subsequent information states that the patient is, at times, subject to spasms, and that there is partial paralysis of the left side. His disability is rated one-half and permanent.

Case.—Private Samuel H. McCartney, Co. K, 36th Illinois Volunteers, aged 22 years, was wounded at the battle of Pea Ridge, Arkansas, March 8th, 1862, by a conoidal musket ball, which struck the frontal bone about two inches above the right

superciliary ridge, passing from the left to the right, crushing the bone at point of contact and lodged about one and a quarter inches from point of entrance. The dura mater was not injured. The wound healed in about four months, and on July 25th, 1862, he was discharged the service. On February 15th, 1866, Pension Examiner John Young reports that he was troubled with pain in the head at the point of injury, was subject to vertigo and could not bear exposure to sun. His mind was also impaired. He is not a pensioner.

CASE.—Sergeant *J. A. Thompson,* Co. E, 45th Georgia Regiment, received a gunshot injury of the frontal sinus at the battle of the Wilderness, May 5th, 1864. On May 12th was admitted to hospital at Farmville, Virginia. There was a sanious discharge from the frontal sinus; otherwise the case progressed favorably and the patient was allowed to go home on furlough.

CASE.—Private Jacob Fisher, Co. D, 82d Ohio Volunteers, was wounded by a spent ball at the battle of Chancellorsville, Virginia, May 2d, 1863, which impinged upon the frontal bone above the left eminence, and produced a slight fracture. He was conveyed to the Harewood Hospital at Washington; on May 9th was sent to the McClellan Hospital, Philadelphia, and on July 6th, to the Sixteenth and Filbert Streets Hospital. No untoward symptoms are recorded, and the patient was returned to duty on July 7th, 1863; was discharged July 11th, 1863, and pensioned, being subject to pain and vertigo. His disability is rated one-half, and perhaps permanent.

CASE.—Private Thomas M———, Co. C, 4th New York Volunteers, was wounded near Antietam, Maryland, September 16th, 1862, by a conoidal ball which fractured the mastoid portion of the left temporal bone. He remained in the field hospital until the 26th, when he was admitted into the Mount Pleasant Hospital, Washington, D. C. Phlegmonous erysipelas attacked the scalp, and the inflammation extended to the membrane of the brain and death supervened on the 5th of October. The pathological specimen is represented in the adjacent wood-cut, (FIG. 76.) The injury of the outer table involves a little over one square inch of surface; that of the inner table measures one by one and a fourth inches, and includes the groove for the lateral sinus. Two fragments are attached, the free edge of one being depressed two lines. The fractured surfaces are necrosed. The specimen and history were contributed by Assistant Surgeon C. A. McCall, U. S. A.

FIG. 76.—Section of a cranium showing a gunshot fracture of the mastoid process. *Spec.* 161, Sect. I, A. M. M.

CASE.—Private Thomas P———, Co. D, 30th Maine Volunteers, was, on April 5th, 1865, admitted to the Jarvis Hospital, Baltimore, Maryland, with typhoid fever. He had partially recovered from fever, when he died on July 2d, 1865. The autopsy revealed an indented fracture of the frontal bone, above and external to the right frontal eminence. The rim of depression was three-fourths of an inch in diameter, and the depth in the centre one-fourth of an inch. A portion of the outer table had been removed. The inner table was fractured in three triangular plates, all of which were firmly consolidated, and all the fissures were filled up by a deposit of new bone; the depression of that table being two lines. The substance of the brain immediately under the injured bone was found softened and disorganized. The pathological specimen is No. 2619, A. M. M., and was contributed, with the history, by Assistant Surgeon D. C. Peters, U. S. A.

CASE.—Private *D. L. Underwood,* Co. D, 18th Georgia Regiment, received a gunshot wound of the head involving the frontal sinus. He was admitted into the Jackson Hospital, division No. 1, Richmond, February 17th, 1865. A fistula afterward formed. He was furloughed for sixty days.

CASE.—Sergeant Augustus Reinwald, Co G, 42d Pennsylvania Volunteers, was wounded at the battle of South Mountain, Maryland, September 14th, 1862, by a conoidal ball, which entered the left side of the face at base of nose, passed backward, and emerged from behind the right ear, separating the mastoid process of the temporal bone. He became insensible. For several hours after return of consciousness there was bleeding from mouth, ear, and eye. On September 29th, he was admitted to the Patent Office Hospital, Washington, and on October 5th sent to Ladies' Home Hospital, New York City. The portio dura and third pair of nerves were paralyzed. There was loss of vision of right eye, and of sensation and mobility of right side of face. The patient was unable to swallow or open his mouth. Febrile action set in, which, together with pain in head and profuse suppuration of wound, rapidly reduced the strength of the patient. He became pale, weak, and emaciated; skin was moist, appetite poor; pulse regular, slow, and compressible; the eye was lachrymose, and the mouth drawn to opposite side. The wound in the face healed, but the posterior wound continued to discharge profusely. He was discharged on March 21st, 1863, and pensioned, his disability being rated one-half, by Pension Examiner A. B. Mott.

In many of the cases classified under the head of gunshot fractures of both tables of the skull without known depression, the details of the symptoms and treatment are very meagre, and it is impracticable to verify the diagnoses from the evidence presented in the reports. The following series fairly illustrates this class of cases, in which the instances of recovery and pension largely predominated:

CASE.—Lieutenant John Adams, Co. G, 35th Ohio Volunteers, aged 30 years, was wounded at Chickamauga, September 19th, 1863, by a conoidal musket ball, which fractured the upper portion of the right side of the frontal bone; he also received a

gunshot wound of the hand. Treated at the hospital of the 3d division, Ninth Corps, the hospital at Stevenson, Alabama, the officers' hospital at Nashville, and the general hospital at Covington, Kentucky, where he arrived May 26th, 1864, and was discharged June 3d, 1864. In September, 1867, he was a pensioner, his disability being rated three-fourths and permanent.

CASE.—Captain R. P. Andis, Co, B, 99th Indiana Volunteers, aged 34 years, was wounded near Atlanta, Georgia, July 21st, 1864, by a conoidal musket ball, which fractured the left temporal bone. Treated at hospital of the 4th division, Fifteenth Corps, until August 13th, when he was sent north; admitted to Grant Officers' Hospital, near Cincinnati, December 20th; was discharged the service December 30th, 1864, by special order of the War Department. In July, 1868, he was a pensioner, his disability being rated two-thirds and temporary.

CASE.—Sergeant Stephen Aldrich, Co. E, 141st New York Volunteers, aged 26 years. Fracture of the occipital bone by a conoidal musket ball. Dallas, Georgia, May 25th, 1864. Treated at the hospital of the 1st division, Twentieth Corps, the field hospital at Chattanooga, the Sherman Hospital at Nashville, and the hospitals at Jeffersonville and Elmira. Discharged from service February 27th, 1865. In March, 1868, he was a pensioner, his disability being rated one-half and temporary.

CASE.—Private George H. Barlow, Battery K, 14th New York Artillery, aged 26 years. Fracture of the frontal bone above the right eye, by a conoidal musket ball. Petersburg, June 17th, 1864. Treated at the regimental hospital, Mount Pleasant, Chester, and, after several transfers, at Carver Hospital. Discharged from service May 29th, 1865, and pensioned, his disability being rated total.

CASE.—Private Charles H. Barrett, Battery G, 2d Massachusetts Heavy Artillery, aged 25 years. Fracture of the right side of the cranium by a piece of shell. Plymouth, North Carolina, April 8th, 1864. Taken prisoner. Exchanged December 5th, 1864, and was treated in No. 1 hospital, Annapolis, and Dale Hospital, Worcester, Massachusetts. Discharged from service July 7th, 1865. In July, 1868, he was a pensioner, his disability being rated total and temporary.

CASE.—Private C. F. Benton, Co. E, 116th Illinois Volunteers, aged 23 years. Fracture left side of frontal bone by a piece of shell. Jonesboro', Georgia, August 31st, 1864. He was admitted to the hospital of the 2d division, Fifteenth Corps, where simple dressings were applied; on September 5th, was sent to the hospital of the Fifteenth Corps, and on November 30th, to Camp Butler, Illinois. Discharged from service April 8th, 1865. In July, 1868, he was a pensioner, his disability being rated total and permanent.

CASE.—Private Henry A. Bliss, Co. I, 18th Massachusetts Volunteers. Fracture of the temporal, malar, and superior and inferior maxillary bones, right side, by a conoidal musket ball. Cold Harbor, Virginia, June 1st, 1864. Treated in the Fifth Corps, 1st division, Alexandria, De Camp, and Dale hospitals. Discharged May 9th, 1865. Not a pensioner.

CASE.—Private Jacob Burnes, Co. K, 100th Pennsylvania Volunteers, aged 27 years, was wounded at Fort Steadman, before Petersburg, March 25th, 1865, by a fragment of shell, which entered anterior to junction of coronal and sagittal sutures, fracturing the skull to the extent of three-fourths of an inch, but not detaching the bone. He was admitted to Carver Hospital, Washington, on April 5th, 1865, and was transferred, on April 9th, to Mower Hospital, Philadelphia, where he was discharged from service on May 29th, 1865, with every prospect of entire recovery. Is not a pensioner.

CASE.—Private Peter Campbell, Co. C, 81st Pennsylvania Volunteers, aged 17 years, was wounded at Hatcher's Run, Virginia, March 25th, 1865, by a conoidal musket ball, which struck the skull near the junction of the sagittal and lambdoid sutures, carrying away portions of bone. Treated in the hospital of the 1st division, Second Corps, and at the Armory Square, White Hall, McClellan, and Mower hospitals. Discharged from service July 31, 1865. Not a pensioner.

CASE.—Private J. A. Dietz, Co. G, 3d New York Volunteers, aged 24 years. Fracture of cranium and wound of shoulder, by a twelve-pound shot. Drury's Bluff, Virginia, May 16th, 1864. Treated in the hospital of the 1st division, Tenth Corps, and at Mower, De Camp, and Ira Harris hospitals. Discharged June 15th, 1865, "able to earn partial subsistence."

CASE.—Private Thomas Johnson, Co. G, 146th New York Volunteers, aged 42 years. Fracture and loss of a portion of the occipital bone by a piece of shell. Petersburg, June 24th, 1864. Treated at division, Alexandria, Carver, and Ira Harris hospitals. Discharged from service May 4th, 1865, and pensioned, his disability being rated one half. At the latter date, his limbs and faculties were normal, but his strength was impaired, and he was only able to earn partial subsistence.

CASE.—Private Augustus Juno, Co. G, 147th New York Volunteers, aged 40 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal ball, which fractured the cranium. On the same day he was admitted to the hospital of the 4th division, Fifth Corps. The injury was considered slight, and, apparently, caused little or no inconvenience, as the man served with his regiment again until February 1st, 1865, when he was admitted to the Fifth Corps hospital at City Point. On February 14th, he was sent to the hospital at Point Lookout, Maryland, where he remained until June 10th, 1865, when he was discharged the service. In July, 1868, he was a pensioner, his disability being rated at one half and temporary. His pension was increased on March 21st, 1870.

CASE.—Private James Landon, Co. K, 179th New York Volunteers, aged 19 years. Fracture of the frontal bone by a conoidal musket ball. Petersburg, April 2d, 1865. Treated, by the application of simple dressings, at division, Slough, and Mower hospitals. Discharged from service June 22d, 1865, and pensioned. Pension Examiner J. G. Orton, in a communication dated June 29th, 1865, stated that the wound was still discharging, but that the patient would probably improve. In July, 1868, his disability was rated total and permanent.

CASE.—Private William Meyers, Co. A, 7th Iowa Volunteers, aged 39 years. Fracture of the frontal bone by a conoidal musket ball. Resaca, Georgia, May 15th, 1864. Treated at the hospital at Chattanooga, the No. 1 hospital at Nashville, and the hospitals at Mound City and Davenport. Throughout treatment, the patient suffered from ulcers on various parts of his body, supposed to have been caused by vaccination. Discharged June 21st, 1865, and pensioned, his disability being rated one-third. There was impairment of cerebral functions.

Case.—Private Edward B. Ockington, Co. G, 37th Massachusetts Volunteers, aged 28 years, was wounded at Winchester, Virginia, September 19th, 1864, by a fragment of shell, which produced a stellate fracture of the frontal bone. He was treated at corps, Sandy Hook, and McClellan hospitals. The patient had nearly recovered in December, and was sent to Camp Distribution, Virginia, but he was returned to the Carver Hospital at Washington, on December 16th, and on March 13th, 1865, was transferred to Dale Hospital, Massachusetts, where he was discharged the service on May 24th, 1865. Not a pensioner.

Case.—Private Owen F. Prentice, Co. C, 35th Illinois Volunteers, aged 32 years. Fracture of the frontal bone above the left eye, by a conoidal musket ball. Chattanooga, November 8th, 1863. He was admitted to the Cumberland Hospital at Nashville, on December 9th, and furloughed on the 23d. On April 26th, 1864, he was admitted to the Camp Butler Hospital, Illinois. The wound, at this time, was doing well, but the patient was unable to undergo any active exertion. He was discharged from service June 9th, 1864, on account of total disability. Not a pensioner.

Case.—Private John Spurrier, Co. A, 142d New York Volunteers, aged 22 years, was wounded in an engagement on the Darbytown Road, Virginia, October 26th, 1864, by a conoidal musket ball, which fractured a portion of the parietal bone. On October 29th, he was admitted to the Balfour Hospital, Portsmouth, Virginia, where he remained under treatment until March 10th, 1865, when he was admitted to the Grant Hospital, New York Harbor. At this time, the conjunctiva was inflamed. He improved; was, on April 4th, sent to Rochester, New York, on July 6th, to the Ira Harris Hospital, Albany, New York, and on August 4th, 1865, was discharged the service. Not a pensioner.

Gunshot Fractures of Both Tables of the Cranium with Depression.—I shall now adduce illustrations of the principal varieties of depressed gunshot fracture of the skull. The oblique impact of musket balls upon the vault of the cranium sometimes produces a linear fissure of the outer table, with extended depression or displacement of the vitreous table. This form of accident is more likely to occur in a young subject, and upon those portions of the skull well supplied with diploë. Specimens of this injury are not very common. It would be difficult to select a better illustration than is afforded by the following case:

Case.—Private *M. L. H.* ———, Co. E, 21st Virginia Regiment, aged 20 years, was wounded at Petersburg, Virginia, in the assault on Fort Steadman, March 25th, 1865, by a musket ball which struck the forehead. He was made a prisoner and admitted to the hospital of the Ninth Army Corps at City Point. On March 27th he was conveyed in the hospital transport steamer "State of Maine" to Washington, and placed in the Lincoln Hospital on March 28th, with a wound over the left supra-orbital ridge, apparently inflicted by a glancing musket ball. There were no cerebral symptoms when the patient was admitted, and he seemed to be doing well for several days, being quite free from pain or any febrile movement. The pulse was normal and the bowels in good condition. On April 1st, he complained of a dull deep-seated pain over the left eye. Later in the day he was feverish and restless, his countenance was pale, and his pulse slow and weak. On April 2d, he failed rapidly. On the night of the 3d, he was delirious. On the 4th, there was violent raving, which continued until his death, on the afternoon of April 5th, 1865. At the post-mortem examination, a fissure was found extending into the right orbit, and upward beyond the left frontal prominence. The vitreous table beneath was largely depressed. There was a small abscess in the anterior lobe of the left cerebral hemisphere. The specimen was contributed by Acting Assistant Surgeon J. P. Arthur, and is represented in the accompanying wood-cuts, (Fig. 77 and Fig. 78.) Two fragments of the inner table are driven inward to the depth of half an inch, touching each other by their inner edges like the leaves of a folding door just ajar. (See *Catalogue Surg. Sect.* A. M. M., page 10.)

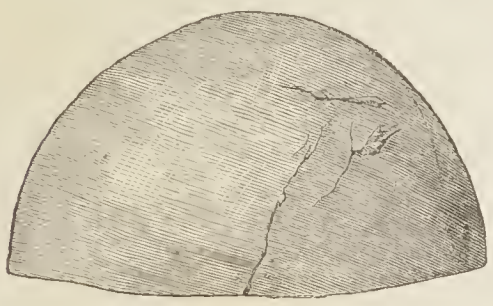


Fig. 77.—Section of the frontal bone, exhibiting a fissure over the left supra-orbital region.—*Spec.* 24, A. M. M.

Fig. 78.—Internal view of the foregoing specimen, showing the extensive splintering of the vitreous table.

The examples of slight depression of the external table with great depression internally were, of course, very numerous. It is necessary to cite but few:

Case.—Private George V———, Co. C, 84th New York Volunteers, was wounded at Chancellorsville, May 3d, 1863, and admitted into Carver Hospital at Washington, D. C., on May 7th, 1863. His injury was supposed to be a simple scalp wound from a musket ball. It was situated over the right parietal protuberance, and on admission was granulating kindly. Ten days subsequently the patient, after a walk out of doors and sitting in the hot sun, had headache and nausea, and the wound gaped and its edges ulcerated. On May 17th there was headache, and his stomach would not retain food. On May

18th the probe detected denuded bone; but no fracture was discovered. There were no febrile or cerebral symptoms. On May 20th a depression of the outer table of the skull was detected. At night there was delirium, and the following day the pulse became feeble and irregular, the stomach irritable, the tongue heavily furred. On this and the following nights the patient had two and a half grains of opium at bedtime. His diet was low, though chicken broth and custard were allowed. On this day there was a decided icteric hue over the whole surface. The patient died on May 22d, 1863, being conscious and rational to the last. At the autopsy, extensive inflammation of the dura mater was observed, and softening of the middle lobe of the right cerebral hemisphere. The notes of the case were drawn up by Assistant Surgeon E. F. Bates, U. S. V., and were contributed with the specimen, which is represented in the wood-cuts above, (FIG. 79 and FIG. 80,) by Surgeon O. A. Judson, U. S. V. The fracture of the external table is half an inch in diameter, and is depressed two lines. The inner table is fractured to the diameter of an inch, and depressed in the centre one line. A few hairs are wedged in among the fragments. The surrounding bone is porous and cribriform.

FIG. 79.—Gunshot fracture of the right parietal bone. *Spec.* 1257, A. M. M.

FIG. 80.—Interior view of the foregoing specimen.

The classical "punctured" fracture of authors was not infrequently observed, and the Army Medical Museum possesses many specimens of this form of injury, one of the best of which is figured below:

FIG. 81.—Fracture of the frontal bone by a pistol ball. *Spec.* 1673, A. M. M.

CASE.—Private James K———, Co. G, 6th New York Cavalry, was wounded at the battle of Gettysburg, July 3d, 1863, by a pistol ball, which produced a punctured fracture of the *os frontis*. He was conveyed to a hospital at Baltimore, and from thence to Carver Hospital, at Washington, on July 24th. He stated that, at Baltimore, he walked about and felt no inconvenience from his wound. On July 27th, he had a convulsion. The wound, which was nearly healed, was laid open, and depressed bone being detected, an effort was made to elevate it. Several small necrosed fragments were removed, and a small quantity of fetid pus escaped. The patient had become comatose, and the operation had no influence in relieving the symptoms. Death took place a few hours subsequently. At the autopsy, the extended depression of the inner table was discovered, and a large abscess of the brain.

FIG. 82.—Interior view of the foregoing specimen.

Another common form is illustrated in the following case:

CASE.—Private Leonard L———, Co. F, 74th New York Volunteers, was wounded at the battle of Williamsburg, May 5th, 1862, and was admitted into Broad and Cherry streets Hospital at Philadelphia, May 13th, 1862. A musket ball had struck near the left parietal eminence, and producing a slight depression of the outer table, had lodged under the scalp, whence it had been removed by a surgeon on the field. The wound had a healthy aspect when the man was admitted, and there was no cerebral disorder. This favorable condition continued unaltered till May 20th, when a febrile movement set in, accompanied by nausea and vomiting; drowsiness and stupor followed, and the patient died comatose on May 23d, eighteen days after the injury. At the autopsy a small clot was found beneath the depressed portion of the vitreous plate; the dura mater was uninjured; the arachnoid near the seat of injury was opaque and studded with deposits of lymph; the gray matter of the brain was softened. The external fracture was found to be circular and a half inch in diameter, a small fragment being driven in on the diploë. The internal table was more extensively fractured, and a plate of bone three-fourths of an inch in diameter was driven inward to the depth of two lines. The specimen, which is well represented in the foregoing wood-cuts, (FIG. 83 and FIG. 84,) was presented to the Army Medical Museum by Acting Assistant Surgeon John Neill.

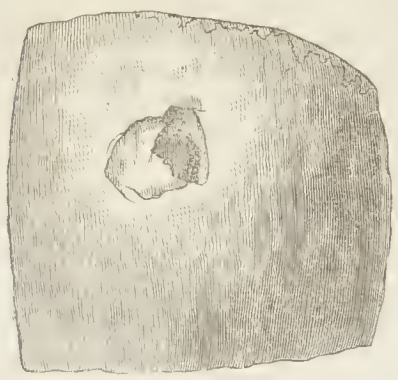


FIG. 83.—Portion of left parietal, showing a slightly depressed fracture of the outer table. *Spec.* 224, A. M. M.

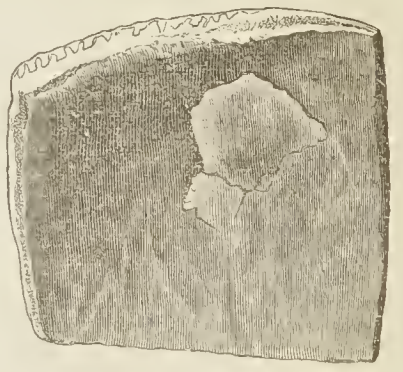


FIG. 84.—Interior view of the foregoing specimen, exhibiting extensive splintering of the vitreous table.

It may be well to give a few more illustrations of the differences in the appearances of the outer and inner tables after gunshot fracture:

CASE.—Sergeant Oscar B. L———, Co. A, 22d Iowa Volunteers, aged 25 years, was wounded at the battle of Cedar Creek, Virginia, October 19th, 1864, by a musket ball which fractured and depressed the right parietal bone. He was at once admitted

to the Sheridan field hospital, and on October 24th sent to the Jarvis Hospital, Baltimore, Maryland. On October 29th hemiplegia of the left side was noted. Inflammation of the brain followed. On October 31st, 1864, death took place.

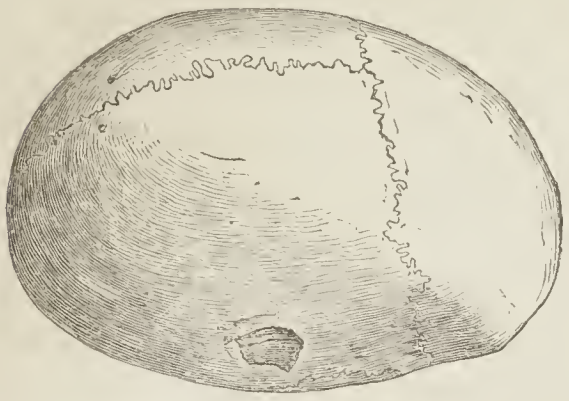


FIG. 85.—Vault of a cranium showing a depressed gunshot fracture. *Spec.* 3415, Sect. I, A. M. M.

At the autopsy a piece of skull about the size of a silver dollar, was found driven in upon the dura mater at the seat of injury. The veins of both hemispheres were intensely engorged. A large abscess immediately beneath the fracture and the lateral ventricle of the brain, was filled with purulent fluid. The pathological specimen figured in the preceding woodcuts, (FIG. 85, and FIG. 86,) together with the notes of the case, were contributed by Acting Assistant Surgeon B. B. Miles. The opening in the outer table is three-fourths of an inch in diameter. The fragments of the inner table measure one by one and a half inches, and consist of two pieces touching at their inner edges. The apex of the angle of depression is half an inch below the general surface of the inner table of the skull.

FIG. 86.—Interior view of foregoing specimen.

Very commonly in fractures of the skull by musket balls, long fissures extend from the point at which the outer table of the skull is crushed by the direct impact of the missile:

CASE.—Private Edwin L. C———, Co. I, 34th Massachusetts Volunteers, aged 26 years, was wounded at the battle of New Market, Virginia, May 15th, 1864, by a musket ball which fractured and depressed the left frontal, temporal, and parietal bones. On the 18th, he was conveyed to the hospital at Cumberland, Maryland, in an insensible condition. Great prostration of the nervous and vascular system was apparent. Consciousness never returned, though death did not occur until May 21st, 1864. At the autopsy the meninges were found much congested and covered with slight patches of pus. Fragments

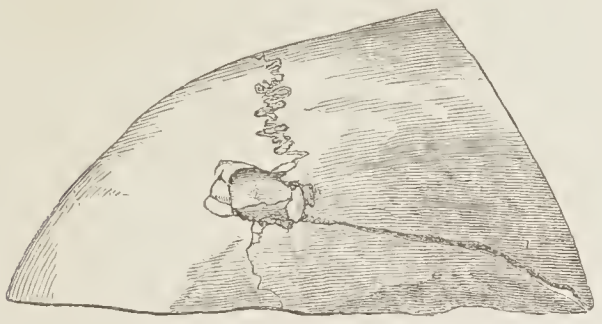


FIG. 87.—Section of cranium showing a complete fissure in the left parietal and temporal, caused by a musket ball. *Spec.* 4255, Sect. I, A. M. M.

of the frontal and temporal bones had been driven upon the brain substance causing softening and discoloration. The whole hemisphere was highly injected, and in the left ventricle was found an effusion of blood. The pathological specimen is represented in the foregoing woodcuts, (Fig. 87 and Fig. 88,) and shows a complete fissure two and a half inches in length in the left parietal and a depressed fracture of the frontal and parietal and temporal bones at their junction. A portion of the vitreous lamina nearly three-fourths of an inch in diameter is depressed one line at the point of impact in front of the anterior angle of the parietal. The specimen was contributed by Surgeon J. B. Lewis, U. S. V.

FIG. 88.—Interior view of the foregoing specimen

CASE.—Private Thomas Brennen, Co. I, 65th New York Volunteers, aged 30 years, was wounded at the battle of Cedar Creek, Virginia, October 19th, 1864, by a musket ball which fractured the frontal bone near the median line, a portion of the missile entering the brain. He was conveyed to Baltimore, and on the 24th was admitted to the Jarvis Hospital. Hemiplegia of the left side had already ensued. Death resulted October 25th, 1864. At the autopsy the opening in the bone was found to measure three-fourths by one and one-fourth inches. A fissure four inches in extent passed upward, across the coronal suture, into the right parietal bone, and two others passed downward and laterally. A piece of the inner table, measuring one-fourth by one inch, was partially fractured and depressed one-fourth of an inch. Two circular pieces of bone, three-fourths of an inch in diameter, were found driven into the dura mater, the brain substance in the vicinity being much softened. The left hemisphere was covered with clotted blood. The missile was found lodged in the third ventricle, left side. The pathological specimen is No. 3413, Sect. I, A. M. M., and, with the history, was contributed by Acting Assistant Surgeon B. B. Miles.

CASE.—Private John H. Wingert, Co. E, 14th Indiana Volunteers, received a depressed fracture of the frontal bone at the battle of Fredericksburg, December 13th, 1862. The missile produced an opening two and a quarter inches in length and three-fourths of an inch in width, extending from the inner angle of the right eye upward and outward. He was sent to the hospital of the 3d division, Second Corps, and on December 18th was admitted to Harewood Hospital, Washington. The dura mater was found lacerated, but no fragments of bone were in the wound. Inflammation of the brain and its membranes existed, and the surrounding integuments presented an erysipelatous appearance. The pulse was one hundred and twenty and

bowels costive. No paralysis existed, and the patient answered questions correctly. On December 19th stupor supervened, muttering delirium followed, and death occurred December 20th, 1862. On removing the calvaria, the anterior half of the dura mater was found thickened, and the superior portion of the anterior lobe of right hemisphere was completely disorganised. The ventricles were filled with a sanguineous fluid, and the corpus callosum was softened. The skull-cap was fissured.

Other examples of fissures extending from the point of impact on the skull of gunshot projectiles are shown in specimens 2904, 3150, 3413, and 3051. The many varieties in the form of depressed fractures of the cranium produced by gunshot projectiles, and depending on the size, weight, velocity, and angle of incidence of the missiles, are very amply illustrated in the surgical cabinets of the Army Medical Museum. It is doubtful, however, if drawings, however carefully made, would enable surgeons to make such deductions as they might reach by examining the specimens themselves; and it is better to occupy the space by a large number of abstracts of cases in which the facts have been carefully verified, than by profuse illustration of minute variations in the forms of such fractures, especially as in treating of penetrating and perforating fractures of the skull and of exfoliation and trephining, additional illustrations will be introduced. Therefore, but a few more specimens will be noticed here. That represented in the adjacent wood-cut was believed by Surgeon Vanderkieft, U. S. V., who presented it, to show a fracture produced by a musket ball at very long range, in the case of a Confederate sharpshooter, posted in a tree at the summit of South Mountain, whence he was dislodged by the Union skirmishers. All of the depressed fragments are adherent by their outer edges. The fracture is so unlike any others produced by musket balls that it is questionable if it did not occur in falling from the tree, or, perhaps, *post mortem*, by a blow from a musket.

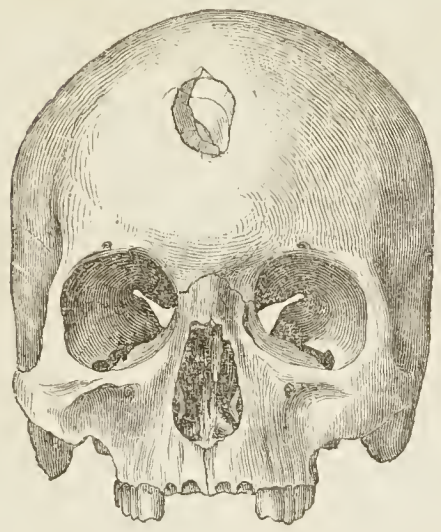


FIG. 89.—Indented fracture of the frontal bone. *Spec.* 1223, Sect. I, A. M. M.

The next case illustrates a fracture, in which the fragments were much displaced, caused by a pistol ball at short range:

CASE.—Sergeant *Charles A. C———*, Co. A, 3d Virginia Cavalry, was wounded in a skirmish near Culpeper, Virginia, October 11th, 1863, by a pistol ball which fractured the superior portion of the frontal bone a little to the left of the median line. He was taken prisoner, conveyed to Washington, and taken to the Emory Hospital on the 13th. He was free from pain and conscious when admitted, but had some tendency to stupor. Spiculæ of bone were removed from the wound, simple dressings applied, and a cathartic administered. On the 14th the tendency to coma increased, and a venous hæmorrhage from the wound occurred, and cerebral matter exuded. The pulsations of the brain were distinctly visible at the opening. At eight o'clock in the evening, these symptoms were still graver, and the patient could be aroused only with great difficulty. He gradually sank and died on the following morning, October 15th, 1863. The autopsy showed that the ball had split upon the skull, one portion passing underneath the scalp for a short distance, the other entering the brain. The left lobe of the cerebrum was greatly disorganized and broken down. The exact point of lodgment of the ball could not be ascertained, as it dropped through the disorganized

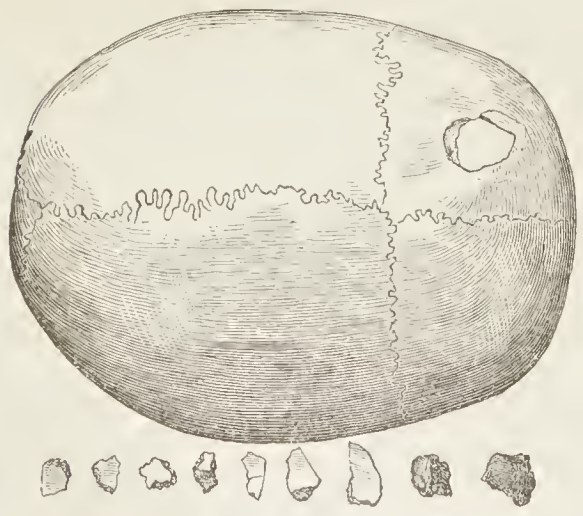


FIG. 90.—Calvaria and fragments of bone and pistol ball. *Spec.* 1727, Sect. I, A. M. M.

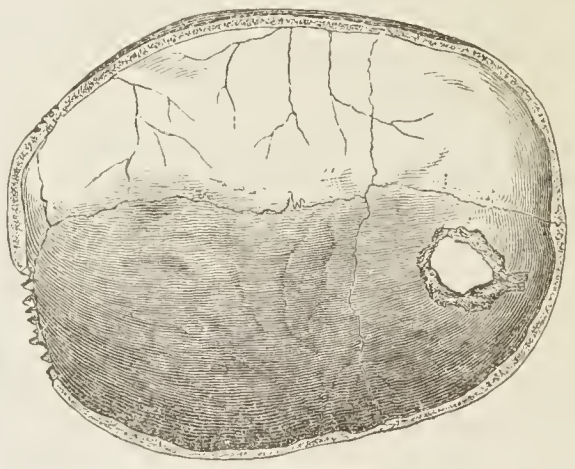


FIG. 91.—Internal view of the foregoing specimen.

tissue at the dissection. The calvaria and fragments of ball are represented in the adjacent wood-cut. The frontal bone is fractured and depressed one inch above and internal to its left eminence. The opening measures one-half by one inch externally, being slightly more extensive on the inner table. The specimen and history were contributed by Surgeon N. R. Mosely, U. S. V.

The next case illustrates not only the fracture, but a synostotic cranium curiously deformed by the premature union of the sutures:

CASE.—Private *A. P. H*——, Co. A, 50th Georgia Regiment, aged 21 years, was wounded at the battle of South Mountain, Maryland, September 14th, 1862. A musket ball struck the frontal bone near the left frontal eminence, causing fracture and depression; another ball entered the left arm just below the head of the humerus, fractured the bone and escaped at the inferior angle of the scapula. On October 27th, he was admitted to the hospital at Frederick, Maryland, in a very low condition and suffering from diarrhœa. Tonics and stimulants were freely given. No symtoms of paralysis, compression of the brain, or other cerebral disturbance presented themselves. The arm was put in a splint. Profuse and unhealthy discharge from the wounds soon weakened the patient, and he died November 25th, 1862, from exhaustion At the autopsy the brain on the injured side was found softened. The depressed portion was ovoid, measuring externally three-fourths by one and three-fourths inches. The inner table was fractured more extensively than the outer. The pathological specimen is represented in the adjoining wood-cut, (FIG. 92,) and was contributed by Assistant Surgeon G. L. Porter, U. S. A.

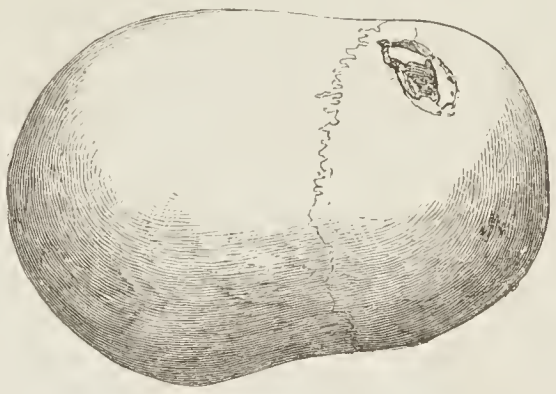


FIG. 92.—Skull-cap showing a depressed gunshot fracture of the left side of the frontal bone. *Spec.* 774, Sect. I, A. M. M.

In the following cases of gunshot depressed fracture of the cranial bones, the patients were discharged on account of disabilities of a serious nature, resulting from their injuries:

CASE.—Lieutenant Jacob Fryburger, Co. K, 51st Pennsylvania Volunteers, aged 28 years, was wounded in an engagement before Petersburg, Virginia, June 18th, 1864, by a conoidal musket ball, which slightly injured and depressed a portion of the frontal bone. He was admitted to the hospital of the Ninth Army Corps; on June 21st, was sent to the 1st division hospital at Annapolis, Maryland; and on August 25th to the Officers' Hospital at the latter place. He was discharged the service October 5th, 1864, and was pensioned, his disability being rated as total and probably temporary. Pension Examiner E. Swift, of Easton, Pennsylvania, reported on February 22d, 1865, that in the case of this officer, any slight exposure caused great dizziness or vertigo. Besides the head injury, he had received a bad gunshot flesh wound of the back, which, however, had healed at the date of Dr. Swift's report.

CASE.—Private Louis Starnkopf, Co. A, 33d New Jersey Volunteers, aged 36 years, was wounded at the battle of Buzzard Roost, Georgia, May 9th, 1864, by a conoidal musket ball which fractured and depressed a portion of the frontal bone. He was sent to the hospital of the 2d division, Twentieth Corps, thence was sent via Chattanooga and Nashville, Tennessee, to the Jefferson Hospital, Indiana, where he remained under expectant treatment until the 27th of July. He was then furloughed, and at the expiration of his leave was admitted to the Ward Hospital, New Jersey. On the 28th of September, 1864, he was returned to duty. On June 23d, 1865, Assistant Surgeon P. Adolphus, U. S. A., reported the patient suffering from chronic cerebritis with softening of the brain; whereupon he was discharged the service June 29th, 1865, and pensioned, his disability being rated three-fourths.

CASE.—Private William McQuown, 1st Regiment Veteran Reserve Corps, was admitted to the Armory Square Hospital, Washington, from his company on September 18th, 1864, with a depressed fracture of the frontal bone. The records do not show where or when the injury was received. The patient recovered and was discharged the service October 24th, 1864, on account of anchylosis of the right elbow-joint and fracture and depression of the frontal bone, causing derangement of the functions of the brain. The case is reported by Surgeon D. W. Bliss, U. S. V. The patient made a claim for pension, but it was not allowed for lack of evidence.

CASE.—Private Thomas C. Little, Co. E, 20th Maine Volunteers, aged 42 years, was struck by a conoidal musket ball at the battle of Gettysburg, July 2d, 1863, which wounded the scalp and fractured a portion of the external table of the frontal bone. He was admitted into the Satterlee Hospital at Philadelphia on July 10th, and on the 1st of September a portion of exfoliated bone about one inch square was removed from the wound. Cerate dressings were afterward applied, and the patient continuing to improve, was, on November 6th, placed on light duty in the hospital, where he remained until December 23d, 1863, when he was transferred to the Veteran Reserve Corps, and shortly afterward returned to duty. The case is reported by Acting Assistant Surgeon J. Roberts. He was discharged the service June 28th, 1865, and pensioned, his disability being rated total and permanent. Subsequent reports show the patient to be gradually failing from the effects of the wound, and suffering from general derangement of the nervous system.

CASE.—Private Jeremiah Donovan, Co. A, 9th New York Volunteers, was wounded in an engagement at Roanoke Island, North Carolina, February 8th, 1862, by a conoidal musket ball which fractured and depressed a portion of the frontal bone in the vicinity of the right eminence. The patient recovered, and was examined in 1866 by Pension Examiner James Neil, Harlem, New York, who reported him complaining of headache, dizziness, confusion of ideas, and of being easily tired. There was impairment of sight in the right eye and a large depression existed over seat of original injury. He was discharged the service April 22d, 1862, and pensioned, his disability being rated five-eighths, permanent, and liable to increase.

CASE.—Private David D. Lathrop, Co. K, 18th Connecticut Volunteers, aged 21 years, was wounded at the battle of Piedmont, West Virginia, June 5, 1864, by a conoidal musket ball which fractured the external table of the frontal bone. He was conveyed to Frederick, Maryland; was there admitted into hospital on the 20th, and on July 3d was sent to the Knight Hospital, New Haven, Connecticut; thence was sent on October 18th to Readville, Massachusetts, and on February 13th, 1865, was transferred to the Veteran Reserve Corps. He was discharged the service June 5th, 1865, and pensioned, his disability being rated one-half and permanent. A report since received states that the wound had healed, with defective audition in the left ear.

CASE.—Private *Daniel McGinish*, Co. B, 47th Alabama Regiment, was admitted to Confederate hospital at Lynchburg, Virginia, with a gunshot wound of forehead. Both tables of the os frontis were destroyed. He was discharged February 2d, 1863.

CASE.—Private George H. Murphy, Co. E, 11th Pennsylvania Volunteers, was wounded at Bull Run, August 30th, 1862, by a musket ball which entered behind the mastoid process of the left temporal bone, fracturing a portion, and emerged immediately exterior to right ala nasi. He was conveyed to Alexandria, and on September 3d, was admitted to the 3d division hospital. The muscles of the lower jaw were rigid, and spiculæ of the mastoid process were discharged from time to time. At the time of his discharge from service, October 23d, 1862, the wound had not entirely healed. Pension Examiner J. H. Anawalt, in a communication dated March 6th, 1867, reports that the left lachrymo-nasal duct had closed, the sac constantly becoming distended with secretion; that there was hyperæsthesia of left side of face; and that the patient could not bear exposure to cold without much suffering. In March, 1868, his disability was rated one-half and permanent.

CASE.—Private Newton Black, Battery I, 2d Pennsylvania Artillery, aged 19 years, was wounded at the battle of Chapin's Farm, Virginia, September 29th, 1864, by a conoidal ball, which fractured the occipital bone. He was admitted to the Base Hospital of the Eighteenth Corps at Point of Rocks, Virginia, on the next day; thence was conveyed, on the 5th of October, to the hospital at Fort Monroe, and on the following day sent by steamer to the Lovell Hospital, Portsmouth Grove, Rhode Island. In December, he was furloughed, and on the 19th of May, 1865, discharged from service, being still subject to attacks of vertigo and headache. In July, 1868, he was a pensioner, his disability being rated total and permanent.

CASE.—Corporal Isaac Clapp, Co. E, 84th Indiana Volunteers, aged 28 years. Fracture of occipital bone by a piece of shell. Near Kenesaw Mountain, June 23d, 1864. Treated at division hospital, hospital No. 19 at Nashville, Brown Hospital at Louisville, and at the hospital at Madison, Indiana. Discharged March 4th, 1865, and pensioned. According to certificate of disability, there was loss of bone to the size of a dollar, and the patient suffered from frequent attacks of dizziness.

CASE.—Private Andrew Wolfran, Co. C, 118th Ohio Volunteers, aged 35 years, was wounded at Resaca, Georgia, May 14th, 1864, by a conoidal ball, which entered near the lambdoid suture, and emerged in front and below the left ear. He was discharged June 26th, 1865, and pensioned. The hearing of the left ear was destroyed, the muscles of the left side of the face were paralyzed, and he was unable to close the left eye, the sight of which is affected. His disability is rated total and temporary.

CASE.—Private Alexander Hunter, Co. H, 54th Massachusetts Volunteers, was wounded in action at Morris Island, South Carolina, August 18th, 1863, by a fragment of shell, which caused a partial fracture of cranium. He was treated in regimental hospital, and apparently recovered, as he was returned to duty April 24th, 1864; but he was discharged from service June 30th, 1864, from which date he has been pensioned, his disability being rated one-half, and, probably, temporary.

CASE.—Private Edward J. Whitmore, Co. A, 57th Illinois Volunteers, aged 25 years, was wounded at Allatoona Pass, Georgia, October 5th, 1864, by a conoidal musket ball, which fractured both tables of the right parietal bone. He was admitted on the same day to the hospital of the 4th division, Fifteenth Corps, and remained in field hospital until January 23d, 1865, when he was sent to Hospital No. 1, Beaufort, South Carolina; thence he was conveyed per hospital steamer Ben Deford to New York, where he was admitted to the McDougall Hospital on January 29th, 1865. The treatment consisted in the application of simple dressings. On March 8th, he was sent to the St. Joseph Hospital, Central Park, and was discharged from service on March 14th, 1865. The vision of the right eye was destroyed. Not a pensioner.

CASE.—Private Harvey Platt, Co. A, 7th Indiana Volunteers, aged 25 years, was wounded at the battle of Spottsylvania Court House, May 12th, 1864, by a conoidal musket ball which fractured the skull. In the same engagement, he received a wound of the right leg. He was admitted to the hospital of the 4th division, Fifth Corps; thence was sent to the Mount Pleasant hospital at Washington on the 16th, and was transferred, on the 18th, to McKim's Mansion Hospital, Baltimore. After several other transfers, he was finally admitted into hospital No. 4, at Madison, Wisconsin, on September 1st, 1864, and discharged from service on January 20th, 1865, and pensioned. Pension Examiner M. H. Harding states that the patient is disqualified for manual labor during the warm season, owing to vertigo and pain in the head, which seriously impair his health. He rates his disability three-fourths.

CASE.—Private *J. D. Spencer*, Co. K, 3d Virginia Cavalry, received at the battle of Bull Run, July 21st, 1861, a gunshot fracture of both tables of the right parietal bone. He was conveyed to the hospital at Farmville, where he was discharged April 22d, 1864. There was extensive derangement of the nervous system, and the patient was unfit for duty.

CASE.—Private James D. Potter, Co. F, 99th New York Volunteers, was wounded in an engagement near Suffolk, Virginia, in April, 1863, by a conoidal ball which fractured the left parietal bone three-fourths of an inch anterior to the protuberance. He was sent to the regimental hospital, and on May 26th, was sent to the Hampton Hospital, Virginia, where partial recovery took place; and on August 6th, 1863, was transferred to the Veteran Reserve Corps. He was discharged the service June 13th, 1864, and pensioned. On March 13th, 1869, Pension Examiner J. T. Burdick reports his condition very fair for one of his age, which was sixty-two years, and adds: "he is subject to frequent and irregular attacks of vertigo, and has impaired memory." He rates his disability one-half, permanent.

CASE.—Private Porter C. Johnson, Co. B, 3d Pennsylvania Reserves, received, during the Peninsular Campaign, July, 1862, a gunshot wound of the skull. On July 3d, he was conveyed to the steamer State of Maine, and on July 7th, was admitted to Satterlee Hospital, Pennsylvania. The wound healed, and on September 25th, 1862, he was discharged the service, and pensioned. There was constant headache and vertigo, inability to bear exposure to heat, and the patient was mentally and physically imbecile, according to the report of Pension Examining Surgeon T. B. Reeve.

CASE.—Sergeant William Shaftoe, Co. K, 57th Massachusetts Volunteers, aged 41 years, was wounded at the battle of Cold Harbor, Virginia, June 2d, 1864, by a fragment of shell which struck over the right eye, causing a slight depression. He was admitted to hospital 1st division, Ninth Corps; on June 6th sent to Mount Pleasant Hospital, Washington, D. C., and on June 19th to Mower Hospital, Philadelphia, whence he was returned to duty September 5th, 1864. Discharged June 13th, 1865. Pension Examiner P. L. Stickney, of Chicopee, Massachusetts, reports, February 13th, 1869, that this man was on the Pension List, and that his disabilities had so much increased since his discharge that he was incapable of enduring labor. He had lost his hearing in the right ear, and he suffered from headache, giddiness, and fainting fits, and that his disability was undoubtedly permanent.

CASE.—Sergeant Flavius G. Arrowsmith, Co. G, 115th Pennsylvania Volunteers, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal musket ball which fractured and depressed a portion of the frontal bone a little to the left of the median line and just in front of the coronal suture. He was admitted to the regimental hospital, and on July 11th was sent to McClellan Hospital, Philadelphia. The patient recovered and was returned to duty April 14th, 1864; was discharged the service June 24th, 1865, and pensioned, his disability being rated three-fourths.

CASE.—Sergeant John Sowers, Co. H, 10th New Jersey Volunteers, aged 26 years, was wounded at the battle of Cold Harbor, Virginia, June 2d, 1864, by a conoidal musket ball which fractured and depressed a portion of the frontal bone above the superciliary ridge. He was admitted to the 1st division hospital of the Sixth Corps, thence was conveyed to Alexandria on June 16th, and was treated at the Soldiers' Rest until June 21st, when he was sent to the Haddington Hospital at Philadelphia. After other transfers he was finally sent to the Ward Hospital at Newark, New Jersey, October 13th, 1864, and was returned to duty April 15th, 1865; was discharged the service July 1st, 1865, and pensioned, his disability being rated one-third and permanent.

CASE.—Private Albert Le Clear, Battery C, 1st Ohio Artillery, was wounded at Chickamauga, September 20th, 1863, by a fragment of shell, which fractured and carried away a portion of the right parietal bone. On the 12th of October, he was admitted to the Cumberland Hospital at Nashville, was transferred, on the 16th, to No. 2 hospital, Louisville, and thence, to Camp Chase, Ohio, December 19th, 1863. There was paralysis, with impairment of the mental faculties, which existed at date of his discharge from service, February 2d, 1864. Information from the Pension Office states that Le Clear is a pensioner. There is a deep groove in the parietal bone, with partial paralysis of the right side. His disability is rated total and doubtful.

CASE.—Private John E. Davidson, Co. E, 22d Wisconsin Volunteers, aged 19 years, was wounded at the battle of Kenesaw Mountain, Georgia, June 27th, 1864, by a conoidal musket ball, which fractured the left parietal bone two inches above the ear. He was admitted to the hospital of the 3d division, Twentieth Corps, and two days later was sent to hospital No. 1, at Chattanooga, Tennessee. On the 11th of July, he was admitted into the Cumberland Hospital at Nashville; thence was sent, on the 9th of September, to Madison, Wisconsin. He was discharged at expiration of term of service, May 12th, 1865, suffering from giddiness and constant headache, and was pensioned from that date, his disability being rated at one-third and temporary by the pension examiner, Dr. Joseph Hobbins.

CASE.—Private Lawrence Redding, Co. B, 89th Illinois Volunteers, aged 21 years, was wounded at the battle of Mission Ridge, Tennessee, November 25th, 1863, by a conoidal musket ball, which fractured the left parietal bone near the junction of the sagittal and lambdoid sutures. He was admitted on the same day to Hospital No. 4 at Chattanooga. On November 19th, 1864, he was sent to the Brown Hospital, Louisville, Kentucky, and on the 29th, to the hospital at Mound City, Illinois. The wound was open as late as January 4th, 1865, suppurating freely and causing pain, vertigo, and prostration. He was discharged from service on January 22d, 1865, being entirely unable to undergo any active exertion. The case is reported by Acting Assistant Surgeon A. H. Kellogg. His name is not on the Pension List.

CASE.—Private Peter Balinzifer, Co. A, 44th Illinois Volunteers, aged 38 years, was wounded at the battle of Franklin, Tennessee, November 30th, 1864, by a conoidal ball, which fractured the frontal bone. On December 23d, he was admitted to hospital No. 15, Nashville, from Franklin; on January 3d, sent to the Joe Holt Hospital, Jeffersonville, Indiana; and on January 5th, transferred to the Jefferson Barracks Hospital, St. Louis, Missouri, where he was mustered out of service on June 15th, 1865. He was pensioner at $4 per month until March 8th, 1868. Since that time he has received an increased pension of $8 per month.

CASE.—Private John Worrall, Co. E, 59th New York Volunteers, was wounded at Antietam, September 17th, 1862, by a fragment of shell, which struck the left temporal bone above the eye, and, cutting through the skull, passed obliquely backward over the top of the head. At the same time, while going to the rear, he received a bullet wound through the middle third of the left arm, with injury to the nerve. On the 19th, he was admitted to the hospital of the Second Corps at the Hoffman House, and on the 27th, was transferred to the Satterlee Hospital at Philadelphia, where he is reported as a deserter, on November 3d, 1862; but, as (according to pension certificate) he was discharged from service on October 7th, 1864, (from which date he is pensioned,) the probability is, that he returned to duty, and was mustered out with his regiment. Pension Examiner E. O. Huntington, under date of July 13th, 1869, states, that the patient's arm was numb and weak, and that, being a blacksmith and left handed, it was very inconvenient; and that the effect of the skull wound was such that a stooping position produced dizziness, dimness of vision, and nausea. His disability is rated total and permanent.

CASE.—Corporal John B. Frank, Co. D, 33d Missouri Volunteers, aged 30 years, was wounded in an engagement at Nashville, Tennessee, December 16th, 1864, by a piece of shell, which fractured the cranium. He was, on the same day, admitted to the Cumberland Hospital at Nashville; on January 10th, sent to the Jefferson Hospital, Jeffersonville, Indiana, whence he was furloughed on February 13th, 1865. On March 24th, he was admitted to the Marine Hospital, St. Louis, Missouri, and on May 5th, 1865, mustered out of service. In July, 1868, he was a pensioner at $6 per month, his disability being rated three-fourths by Pension Examiner J. C. Whitehill, of St. Louis.

CASE.—Private John Parkhorst, Battery E, 2d New York Heavy Artillery, aged 50 years, was wounded at Farmville, Virginia, April 7th, 1865, by a conoidal ball, which fractured the upper portion of the right frontal bone. He was admitted to the hospital of the 1st division, Second Corps, and on April 16th, was sent to the Harewood Hospital at Washington. Simple dressings only were required. On May 29th, he was sent to the White Hall Hospital, Bristol, Pennsylvania, and on June 16th, 1865, was discharged the service and pensioned, his disability being rated three-eighths, and permanent. A communication from Pension Examiner T. M. Flandreau, dated November 20th, 1868, says, that since his examination in July, 1867, the patient's general health had greatly failed, which he attributed to continued pain in the head, producing nervousness and drowsiness. The action of the heart was violent and excessive, and, for six months, there were symptoms of ascites, which diminished under treatment. He was a night watchman in a mill, but lost much time. His disability was then rated seven-eighths, and probably permanent.

CASE.—Private Nicholas Rhoade, Battery K, 10th New York Heavy Artillery, aged 21 years, was wounded before Petersburg, July 4th, 1864, by a conoidal musket ball, which fractured and carried away a portion of the right temporal bone. He was admitted to the hospital of the Eighteenth Corps, thence on the 8th, sent to the Fort Monroe hospital, and after four days' treatment was again transferred, by hospital steamer, to the Grant Hospital, New York. He continued in the hospitals of that State until returned to duty from De Camp Hospital on the 22d of November, 1864. He was finally discharged from service on January 27th, 1865, and pensioned. Dr. C. C. P. Clark, of Oswego, reports, in January, 1865, that there was a large loss of substance of the right temporal bone, and that the patient complained of pain and dizziness and loss of memory. The cicatrix was firmly healed.

CASE.—Private John Gool, Co. H, 71st Ohio Volunteers, aged 21 years, was wounded in front of Nashville, Tennessee, December 16th, 1864, by a conoidal musket ball, which fractured and carried away two inches of the frontal bone. He was admitted to hospital No. 1, Nashville, on the 18th, and remained in the different hospitals of that city until the 8th of January, 1865, when he was transferred to Jeffersonville, Indiana. On July 24th, 1865, he was sent to Camp Dennison, Ohio, where he was discharged the service on the 28th of September, 1865. A communication from Pension Examiner W. Y. Kisher, states that the patient is "unable to bear exercise," and rates his disability one-half, permanent.

CASE.—Corporal John G. Whigam, Co. I, 116th Pennsylvania Volunteers, aged 22 years, was wounded near Petersburg, June 16th, 1864, by a piece of shell which fractured the frontal and left parietal bones, carrying away a piece two inches in diameter. He was conveyed to the hospital of the Second Corps, thence was sent by way of City Point to Alexandria, where he was admitted to the 2d division hospital on June 28th. The brain was exposed, but the wound healed kindly, and the patient was discharged the service June 25th, 1865, still incapable of any exertion. Until September 14th, 1869, he was pensioned at six dollars a month. His pension was then increased to fifteen dollars, Pension Examiner W. M. Henson, at Allegheny City, reporting that the pensioner suffered constant pain in the head, and was totally and permanently unfitted for manual labor.

CASE.—Private Jacob Livingston, Co. I, 21st Illinois Volunteers, aged 22 years, was wounded at Rocky Face Ridge, Georgia, May 9th, 1864, by a missile which produced a fracture, without depression, of a portion of the frontal bone. Previous to this a ball passed through the body of the inferior maxillary bone, causing fracture, the destruction of four front teeth, and defective articulation. He was sent to the general hospital at Chattanooga, thence to hospital No. 8 at Nashville, and subsequently to the Brown Hospital at Louisville. Finally he was transferred to Quincy, Illinois, and was mustered out of service August 16th, 1864, and pensioned. A communication from Pension Examiner F. R. Paine, June 15th, 1869, reports patient "able to go about and seeming tolerably well," and rates his disability total, but not permanent in its present degree.

CASE.—Private M. Wilcox, Troop I, 6th New York Cavalry, aged 22 years, was wounded at the battle of Boonsboro', Maryland, July 8th, 1863, by a projectile, which fractured the left parietal bone without known depression or involvement of the brain. He remained in the field hospital until the 18th, when he was conveyed to hospital No. 1, Frederick, Maryland. Simple dressings were applied to the wound. On May 17th, 1864, he was transferred to Baltimore, and was transferred to the Veteran Reserve Corps, August 10th, 1864. He was discharged at Point Lookout, Maryland, (probably at expiration of term of service,) November 2d, 1864, and pensioned. On October 23d, 1867, Pension Examiner Thomas Williams reported that the patient's mental faculties were deranged and the functions of the brain disturbed, and rated his disability one-half and probably permanent.

The following cases of gunshot fracture of the cranial bones were accompanied by hemiplegia or paraplegia, and are selected from a large number of such cases:

CASE.—Corporal Charles Breitenbach, Co. K, 7th Ohio Volunteers, was struck by a musket ball in the squamous portion of the temporal bone which entered the skull and wounded the brain, producing partial hemiplegia, at the battle of Antietam, Maryland, September 17th, 1862. On October 5th, 1862, he was admitted to the hospital at Smoketown, Maryland, and was discharged the service December 19th, 1862. In March, 1868, he was pensioned, his disability being rated total and temporary.

CASE.—Private Henry S———, Co. E, 118th Pennsylvania Volunteers, aged 38, was wounded at the battle of the Wilderness, Virginia, May 9th, 1864, by a conoidal musket ball which fractured and depressed the skull between the frontal

eminences. He was sent to the hospital of the 1st division, Fifth Corps, and on May 15th transferred to Washington, D. C., and admitted into the Mount Pleasant Hospital. So far, simple dressings only had been applied. On May 27th he was transferred to the Satterlee Hospital, Philadelphia. The day following his admission, he was attacked with a profuse diarrhœa, and complained of pain in the head; was dull and drowsy, and at times delirious. On June 1st his mental faculties were completely obscured, and paralysis of motion on the left side was observed, though there was hyperæsthesia of the whole surface. Convulsions of an epileptic character occurred on the 2d, and it was observed that the muscular power of the left side was now restored, and that the right was paralyzed. The pupils, which had hitherto been dilated, were now somewhat contracted; the tongue was dry; the lungs full of coarse râles. Repeated convulsions recurred on the 4th, exhibiting the same remarkable features heretofore mentioned in respect to the side paralyzed. No control over the sphincters remained. Death occurred in the afternoon of June 4th, 1864. At the autopsy the fractured portion of bone was found to be ovoid in shape and corresponding in dimension to the external wound. There was a fracture of the inner table with depression of a portion near the longitudinal sinus to the depth of two lines, and a fissure extended into the frontal sinus. Beneath was a black slough of the dura mater, measuring two inches in length by one in width. The anterior and lateral surfaces of the right hemisphere were bathed with pus, which also filled the great longitudinal fissure and the parts in the region of the ethmoid plates. At the base of the brain was an effusion of serum. The meninges on this side presented evidence of a high degree of inflammation, and could be easily separated in large patches from the convolutions, which were slightly softened, one containing a large abscess. The membranes of the other side were little more than congested. Further than this the brain was healthy. The pathological specimen, an extraordinarily thin calvaria, is No. 2758, Sect. I, A. M. M., and was contributed, with the history, by Acting Assistant Surgeon W. W. Keen, jr.

Case.—Private Charles Lucia, Co. A, 14th United States Infantry, was wounded at the battle of Gettysburg, July 1, 1863, by a missile which entered the frontal bone a little to the right of the nasal eminence, and emerged from the outer canthus, destroying the eye, and fracturing the malar bone. He was admitted to the general field hospital at that place on the 3d, and on the 24th was transferred to the Mulberry street Hospital, Harrisburg, where meningitis supervened, causing death August 8th, 1863. The case is reported by Assistant Surgeon Edward Cowles, U. S. A.

Case.—Lieutenant William T. Simms, 82d New York Volunteers, was wounded at the battle of the Wilderness, Virginia, May 6th, 1864, by a conoidal musket ball, which penetrated the mastoid process of the left temporal bone and seriously injured the internal ear, leaving a small external opening. The missile, which was removed on the field, had become elongated. He was admitted to the hospital of the 2d division, Second Corps, and on May 16th, was sent to Washington for treatment. Until the latter date, he had been speechless; his intellect was greatly impaired. He partially recovered; on June 25th, was transferred to the 59th New York Volunteers as Major; April 18th, 1865, was mustered out of service. The wound was still open, and there was partial paralysis of left side of face, and partial hemiplegia of right side.

Case.—Private Lorenzo D. Kase, Co. G, 188th Pennsylvania Volunteers, aged 18 years, was wounded before Petersburg, Virginia, September 20th, 1864, by a conoidal musket ball, which fractured the skull. He was at once conveyed to the general hospital at Fort Monroe; thence was sent on the 8th of October by steamer to the Lovell Hospital in Rhode Island. The details in the progress of the case are not recorded. He was discharged from service on May 22d, 1865. A communication from the Commissioner of Pensions, dated March, 1868, states that he is a pensioner, and that his disability is rated at two-thirds and permanent. A communication from Pension Examiner W. H. Bradley, dated July 21st, 1869, recommends an increase of pension because of paraplegia.

Case.—Private Jesse Coty, Co. A, 6th Vermont Volunteers, aged 30 years, was wounded before Petersburg, Virginia, April 2d, 1865, by a piece of shell, which fractured the posterior superior angle of the left parietal bone and injured the brain. On the same day he was taken to the regimental field hospital, and thence transferred to the Stanton Hospital at Washington, where he was admitted April 8th, 1865. The treatment, so far as recorded, consisted of simple dressings. He recovered, and was discharged July 1st, 1865. In July, 1868, he was pensioned for an incapacity resulting from dimness of sight and partial hemiplegia of the right side. His disability is rated three-fourths and permanent.

Case.—Private Levi Bittenbender, Co. E, 95th Pennsylvania Volunteers, aged 22 years, was wounded by a fragment of shell, at Spottsylvania Court House, May 13th, 1864, which fractured the right side of the cranium. He was at once admitted to the hospital of the 1st division, Sixth Corps; on the 24th, was sent to the 2d division hospital at Alexandria. On the 13th of June he was transferred to York, Pennsylvania. Paralysis of the lower extremities had ensued. On the 21st of September he was sent to the Turner's Lane Hospital at Philadelphia, and on the 7th of October, 1864, he was discharged from service. Not a pensioner.

Case.—Private Charles C. Drew, Co. C, 16th Connecticut Volunteers, aged 18 years, was wounded near Plymouth, North Carolina, April 20th, 1864, by a fragment of shell, which fractured a portion of the left parietal bone. He was taken prisoner, was exchanged October 20th, admitted to 2d division hospital at Annapolis, and thence he was transferred as follows: On November 27th, to Patterson Park Hospital, Baltimore; on January 10th, 1865, to hospital at York, Pennsylvania; on February 9th, to Knight Hospital, New Haven, Connecticut, whence he was discharged the service June 9th, 1865, and pensioned. On June 6th, 1866, there was right hemiplegia with vertigo and general debility.

Case.—Private Joseph A. Hall, Co. G, 16th Maine Volunteers, aged 27 years, was wounded at the battle of Hatcher's Run, Virginia, February 7th, 1865, by a conoidal musket ball, which fractured the frontal bone without causing depression. On the same day, he was admitted to the hospital of the 3d division, Fifth Corps; on February 10th, 1865, was sent to McKim's Mansion Hospital at Baltimore, and on March 11th, 1865, was transferred to the hospital at York, Pennsylvania, where he was discharged the service, May 16th, 1865, and pensioned. On July 24th, 1865, Pension Examiner A. Blossom reported the patient physically and mentally incapacitated, and hemiplegia of right side existing. He rated his disability three-fourths, and probably permanent.

CASE.—Sergeant James R. Morrison, Co. K, 13th New Hampshire Volunteers, aged 24 years, was wounded before Petersburg, June 23d, 1864, by a fragment of shell, which fractured a portion of the left parietal bone. He was admitted to the hospital of the Eighteenth Corps; thence, he was transferred as follows: on the 25th, to the Chesapeake Hospital at Fort Monroe; on July 4th, by steamer, to Sixteenth and Filbert Streets hospital, Philadelphia; and on January 24th, 1865, to the Webster Hospital in New Hampshire. Paralysis of the right arm and hand had supervened. He was discharged the service May 27th, 1865, and pensioned, his disability being rated one-half and permanent.

CASE.—Sergeant *Slade Wooten*, Co. C, 27th North Carolina Regiment, aged 24 years, received, in an engagement near Petersburg, Virginia, August 15th, 1864, a gunshot fracture of the left parietal bone severing the longitudinal sinus. He was retired on January 20th, 1865, by an examining board. The patient afterward suffered from partial paralysis of the left side accompanied by intense headache, and was unable to undergo any exertion without producing mental confusion.

The following cases of gunshot depressed fractures of the cranial bones were followed by epilepsy:

CASE.—Private John Oxspring, Co. G, 109th Pennsylvania Volunteers, aged 36 years, was wounded at the battle of Chancellorsville, Virginia, May 1st, 1863, by a conoidal musket ball, which fractured the frontal bone between the eminences, probably causing a depression of the inner table. He was conveyed to Washington, and on the 6th was admitted into Lincoln Hospital, where the wound was properly dressed. Frequent epileptic convulsions ensued after a time. In July he was transferred to the Cuyler Hospital, near Philadelphia, where he continued under treatment until the 24th of March, 1864, when he was transferred to the Turner's Lane Hospital. The convulsions continuing, resort was now had to the introduction of an issue pea in the back of the neck, which, however, failed to afford relief, and was soon withdrawn on account of a severe attack of erysipelas following. On May 19th, 1864, he was discharged from service. In January, 1868, his disability was rated as three-fourths and permanent. The case is reported by Acting Assistant Surgeon W. W. Keen.

CASE.—Sergeant John Daley, Co. C, 57th Massachusetts Volunteers, aged 36 years, was wounded in the head at the battle of the Wilderness, Virginia, May 6th, 1864, by a conoidal musket ball. He was sent to Washington on the 16th, and was admitted into the Lincoln Hospital, where no fracture was suspected. On July 18th he was sent north, and on August 25th was admitted to the hospital at Readville, Massachusetts. On October 24th he was sent to the Dale Hospital, Worcester, where it was ascertained that the frontal bone was fractured and depressed. Convulsions of an epileptiform character supervened, but the patient finally recovered, and was discharged the service January 16th, 1865. He was pensioned, and on July 20th, 1867, was reported by Pension Examiner Oramel Martin, to be completely and permanently disabled.

CASE.—Corporal Otis G. Straub, Co, I, 98th Ohio Volunteers, aged 26 years, was wounded at Chaplin's Hill, Kentucky, October 8th, 1862, by a fragment of shell, which fractured and slightly depressed the frontal bone at its centre. Remaining at the field hospital about one month, he was sent to Hospital No. 1, Lebanon, Kentucky, on November 10th, and two days afterward was transferred to Hospital No. 18, Louisville. On January 10th, 1863, the patient was admitted to the hospital at Gallipolis, Ohio, and on October 12th, 1863, was transferred to the Veteran Reserve Corps, still subject to epileptic convulsions, which followed any active exertion. His name is not upon the Pension List.

CASE.—Corporal Ludwig Schweitzer, Co. E, 12th New Jersey Volunteers, aged 23 years, was wounded before Petersburg, Virginia, October 20th, 1864, by a conoidal musket ball which fractured a portion of the frontal bone on the right side. He was sent to the hospital of the 2d division, Second Corps. On the 22d was sent to the depot field hospital at City Point, and on December 15th was transferred to Washington, D. C., and admitted on the following day into the Finley Hospital. The treatment so far as recorded was expectant. On the 5th of March, 1865, the patient was transferred to the hospital at Beverly, New Jersey, thence was sent on the 5th of April to the White Hall Hospital, Bristol, Pennsylvania, and was discharged the service May 17th, 1865, and pensioned, his disability being rated total and permanent. Subsequent information shows that the patient suffered constant pain, vertigo upon slight exertion, and epileptiform convulsions.

CASE.—Private Jacob Yager, Co. K, 55th Ohio Volunteers, aged 23 years, was wounded in an engagement near Atlanta, Georgia, July 20th, 1864, by a conoidal ball which fractured the *os frontis* over the left eye. He was admitted to the hospital of the 3d division, Twentieth Corps, and on July 25th, he was sent to hospital No. 3, Chattanooga, where he remained until April 11th, 1865, when he was transferred to hospital No. 1, Nashville. Epilepsy had supervened. On May 4th he was sent to the Crittenden Hospital, Louisville, Kentucky; on June 13th, to the Brown Hospital of the same city; and on June 22d, to Camp Dennison, Ohio, where he was mustered out on July 18th, 1865.

CASE.—Corporal George Roimas, Co. B, 1st Louisiana Volunteers, received a gunshot wound of the head at Port Hudson, June, 1863. On July 24th, 1863, he was admitted to St. Louis Hospital, New Orleans, and was discharged the service October 22d, 1863, and pensioned. His disability was complicated with hemiplegia and epilepsy, and was rated, on October 22d, 1863, by Pension Examiner George Kellogg, as total and permanent.

CASE.—Private Michael Baudfield, Troop D, 6th New York Cavalry, was admitted to the Harewood Hospital, Washington, August 17th, 1863, with a fracture of the cranium, produced by a piece of shell, and on October 28th, he was sent to DeCamp Hospital. Epilepsy supervened, and on January 8th, 1864, he was discharged the service. He subsequently re-enlisted, but the epilepsy continuing, he was again discharged from service, May 21st, 1864. Not a pensioner.

CASE.—Private James T. Gammon, Co. K, 2d New Hampshire Volunteers, was wounded at Bull Run, August 29th, 1862, by buckshot, which fractured the cranium at the junction of the coronal and sagittal sutures, and slightly depressed the external table. Cold water dressings were applied. On September 2d, the patient was conveyed to Philadelphia, and was received into the Broad and Cherry Streets Hospital on the following day. The missile was found lodged at the seat of fracture, and was

removed. The case progressed satisfactorily. Near the end of October, however, a necrosed fragment of the external table, which had caused considerable irritation, was extracted. He was returned to duty on March 4th, 1863. On January 1st, 1864, he re-enlisted, and at the battle of Cold Harbor, June 3d, 1864, was wounded in the hand. He was admitted to the Finley Hospital at Washington, on June 8th, and was transferred to Knight Hospital at New Haven, Connecticut, on June 19th, 1864. He was still suffering from the original injury of the head and was subject to epilepsy. He was transferred to Concord, New Hampshire, where, on May 20th, 1865, he was discharged the service and pensioned, his disability being rated three-fourths, and probably permanent. Assistant Surgeon John Neill reports the case.

Case.—Sergeant Charles H. Norton, Co. D, 157th New York Volunteers, aged 23 years, was wounded at Gettysburg, July 1st, 1863, by a conoidal musket ball, which struck the right side of the head. He was admitted to a field hospital on the same day. The injury seemed very slight, and he was probably soon returned to duty, as no record of the case can be found until October 6th, 1864, when he was admitted to the Hilton Head Hospital, where a fracture of the right parietal bone was discovered. Simple dressings were applied, and on November 21st, the patient was returned to duty; but, on February 18th, 1865, he was again received into the hospital at Hilton Head, suffering from epilepsy. He was finally discharged from service on March 30th, 1865, and pensioned, his disability being rated total and doubtful. On June 25th, 1868, Pension Examiner G. W. Bradford reports the wound still discharging, with epileptic fits from time to time, causing physical and mental disability.

Case.—Private John Rummerfield, Co. F, 51st Illinois Volunteers, aged 35 years, was wounded at the battle of Chickamanga, Georgia, September 20th, 1863, by a conoidal musket ball, which fractured a portion of the left parietal bone above the eminenee. He remained in the field hospital until October 20th, when he was sent to the hospital at Stevenson, Alabama, and thence, on October 23d, to hospital No. 13, at Nashville. He continued in the hospitals of that city until the latter part of January, 1864, when he was sent to Camp Parole. He was discharged the service on February 3d, 1865, and pensioned. On November 15th, 1867, Pension Examiner D. L. Dieffenbach reported that the wound was covered with integuments, which were soft and painful; that the patient had attaeks of epilepsy, and was unsteady in his gait; and that there was partial hemiplegia of right side, and impairment of memory. His disability is rated two-thirds and permanent.

Case.—Private *James Rouey*, Co. G, 15th Alabama Infantry, received a gunshot fracture of the temporal bone. He was admitted to the No. 9 hospital, Richmond, July 14th, 1863. Epilepsy resulted. The subsequent history and disposition of the patient is unknown.

Case.—Private Daniel P. Roth, Co. A, 42d Indiana Volunteers, aged 26 years, received, in an engagement near Resaca, Georgia, May 24th, 1864, a gunshot fracture of the frontal bone. He was conveyed by way of Chattanooga to Nashville, Tennessee, and admitted to hospital No. 1, on May 27th, 1864. The injury healed rapidly, and the patient was returned to duty on August 4th, 1864. The wound, however, reopened, and he was admitted to the hospital of the 1st division, Fourteenth Corps, on September 24th, but was again returned to duty on October 12th, 1864. On January 30th, 1865, he was, for the third time, sent to a hospital. He was this time admitted to the post hospital at Bridgeport, Alabama, where he died from epilepsy on March 14th, 1865.

Case.—Private Adolph Stahl, Co. B, 119th New York Volunteers, aged 20 years, was wounded at Fredericksburg, May 3d, 1863, by a piece of shell, which fractured the right parietal bone. He was treated in the field hospital for several weeks, and on June 16th, he was admitted to the Lincoln Hospital at Washington, suffering from epilepsy. On July 9th, he was conveyed to Philadelphia, and was admitted to the Christian Street Hospital. Epilepsy continued. In March, 1864, he was transferred to the Turner's Lane Hospital, and on May 11th, 1864, was discharged from service. Not a pensioner.

Case.—Private Lucius Veasey, Co. G, 5th New Hampshire Volunteers, was wounded at Antietam, September 17th, 1862, by a fragment of shell, which caused a compound fracture of the occipital bone. On October 4th, he was admitted to hospital No. 1, at Frederick, Maryland, where he was discharged the service April 22d, 1863. In March, 1868, he received a pension on account of incapacity resulting from epilepsy. His disability was rated total and permanent, by Examining Surgeon Thomas Sanborn, of the Pension Bureau.

Disorders of the nerves of special sense often followed depressed gunshot fractures of the skull, lesions or functional derangements of the optic and auditory nerves being the most common. The subject will be more fully discussed in connection with penetrating and perforating wounds of the skull, but a few cases may be adduced here. Various forms of impaired vision were of very frequent occurrence after depressed fractures of all portions of the periphery of the cranium:

Case.—Private Absalom Mower, Co. G, 111th Ohio Volunteers, aged 23 years, was wounded at the engagement at Atlanta, Georgia, July 24th, 1864, by a conoidal musket ball, which fractured the cranium over the right eye. He was taken to the hospital of the Twenty-third Corps, and was transferred as follows: on August 8th to the Holston Hospital, Knoxville, Tennessee; on November 28th, to hospital No. 8, Nashville; on December 1st, to Jefferson, Indiana; and on April 26th, 1865, to the hospital at Cleveland, Ohio, where he was mustered out of service on June 9th, 1865. The sight of the right eye had been partially destroyed.

Case.—Private William Slantinger, Co. A, 41st New York Volunteers, aged 20 years, was wounded at Gettysburg, July 3d, 1863, by a fragment of shell which fractured the *os frontis*. He was admitted into the Satterlee Hospital, at Philadelphia, on the 5th, where simple dressings were applied. Partial blindness resulted. He was discharged from service December 30th, 1863. Surgeon I. I. Hayes, U. S. V., reports the case. Not a pensioner.

CASE.—Private Abraham Strauss, Co. C, 31st New York Volunteers, was admitted, on October 31st, 1862, to Camp Banks, near Alexandria, Virginia, with a gunshot fracture of the parietal bone. He was discharged the service November 29th, 1862, and pensioned. Subsequently to the patient's discharge, Pension Examiner E. Bradley reports him suffering from vertigo and impaired sight in the left eye, also valvular disease of the heart, and rates his disability total and permanent.

CASE.—Private Charles Owen, Co. F, 179th New York Volunteers aged 31 years, was wounded near Petersburg, Virginia, June 17th, 1864, by a piece of shell which fractured the right parietal bone. On the same day, he was admitted to the hospital of the 1st division, Ninth Corps; thence was conveyed to Washington, and admitted into the Mount Pleasant hospital on July 2d. On July 22d, he was transferred to the Mower Hospital at Philadelphia. Simple dressings, tonics and stimulants were employed in the course of the treatment. He was discharged from service June 10th, 1865. Pension Examiner Bardwell reports on February 1st, 1868, that the patient's vision was impaired and that he was subject to nausea and prostration when excited. He rated his disability as one-half and probably permanent.

CASE.—Private Lyman B. Pollard, Co. G, 16th Maine Volunteers, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a conoidal ball, which fractured the left parietal bone at its anterior superior angle. He was admitted to hospital 2d division, First Corps, and on December 19th was sent to Fairfax Seminary Hospital, where he was discharged on March 31st, 1863, and pensioned. On February 23, 1866, Pension Examiner James Bell reported that exfoliation of bone has occurred from time to time, and that the patient suffers much from pain and vertigo. His disability was then rated at three-fourths and permanent. On October 9th, 1866, Pension Examiner John Benson reported that the exfoliation still continues and that the vision of the right eye is materially affected. His disability is rated total.

CASE.—Private George R. Williams, Co. I, 1st Wisconsin Cavalry, was wounded at Jonesboro', Arkansas, August 2d, 1862, by a projectile which fractured and tore away a portion of the occipital bone near the protuberance. On November 29th he was admitted to the post hospital at Detroit, Michigan, and was discharged the service November 29th, 1862, and pensioned. Pension Examiner W. F. Breakey, under date of January 22d, 1870, reported the patient suffering from partial amaurosis and loss of memory, with great nervous prostration, and rates his disability total.

CASE.—Private Hugh Ward, Co. H, 2d Massachusetts Volunteers, was wounded at Gettysburg, July 2d, 1863, by a conoidal ball, which fractured the cranium at the vertex. He was admitted to the Satterlee Hospital, Philadelphia, on the 7th; thence, on August 4th, was transferred to the Mason Hospital at Boston. Simple dressings only were required, and the wound healed in a short time. The patient, however, was unable to undergo any severe exertion, as it would immediately produce dizziness. He was discharged from service on October 1st, 1863, and pensioned in consequence of total disability, the result of impaired vision and nervous derangement.

CASE.—Private Morris Wingler, Co. C, 26th Wisconsin Volunteers, was wounded at Gettysburg, July 1st, 1863, by a musket ball, which penetrated the frontal bone near the right eminence, and exposed the membranes. He was sent to a field hospital, and on July 8th, was sent to South Street Hospital, Philadelphia, where the ball was extracted. The patient had nearly recovered by September 29th, 1864, when he was transferred to the Veteran Reserve Corps. He was discharged the service, June 30th, 1865, and pensioned. A subsequent report from Pension Examiner L. D. McIntosh informs that bony union has not taken place; that the patient has dimness of vision in the right eye, with pain and dizziness, and rates his disability total and permanent.

CASE.—Sergeant William McKenzie, Co. D, 4th Michigan Volunteers, aged 30 years, was wounded at the Wilderness, on May 5th, 1864, by a conoidal ball, which fractured the right external angular process of the frontal bone. He was conveyed to Washington, and admitted, on the 11th, into the Stanton Hospital; thence was transferred, on the 18th, to the Satterlee Hospital at Philadelphia. The sight of the eye was partially destroyed. The case progressed favorably, though there was a slight discharge from the wound. On examination, the ball was found lodged in the bone, and on the 16th of June, the opening was enlarged and the missile, firmly imbedded in the orbital ridge, extracted. The patient recovered rapidly, and on August 3d, 1864, was transferred to Adrian, Michigan, to be mustered out, his term of service having expired. A communication from the Commissioner of Pensions, dated December 8th, 1869, states the patient has nearly lost the sight of his right eye and suffers from hemicrania, owing to which he receives a pension, his disability being rated five-eighths and permanent.

CASE.—Private *James Baker*, Co. G, 10th Louisiana Infantry, received a gunshot wound of the temporal region, causing depressed fracture of the skull, on November 26th, 1863. He was admitted to the Louisiana Hospital, Richmond. Blindness resulted. The subsequent history and disposition of the case is unknown.

CASE.—Private William Wolven, Co. B, 98th New York Volunteers, aged 17 years, was wounded in front of Petersburg, June 24th, 1864, by a conoidal ball, which fractured the frontal bone over the left eye. He was admitted to the hospital of the Eighteenth Corps, and on June 25th was sent to Hampton Hospital, Fort Monroe; on July 19th, to Lovell Hospital, Portsmouth, Rhode Island, and on August 22d to Ira Harris Hospital, Albany, New York, where he was discharged the service June 30th, 1865, and pensioned, his disability being rated one-fourth and probably permanent. A report from Pension Examiner A. Hasbrouck, about one year subsequently, says that the patient's condition, both physical and mental, appears good, but that he cannot bear exposure to heat. The wound had impaired his eye-sight.

CASE.—Private George W. D. Bair, Co. H, 55th Illinois Volunteers, was admitted to the Marine Hospital, Chicago, Illinois, with a gunshot fracture of the occipital bone at the right of the protuberance. He was discharged from service October 17th, 1862, and pensioned. He had partial amaurosis of right eye, and frequent attacks of neuralgia. His disability is rated three-fourths and temporary.

CASE.—Private Jeremiah N. Featherstone, Co. G, 70th Indiana Volunteers, aged 22 years, was wounded at the affair of Golgotha, Georgia, June 15th, 1864, by a fragment of shell, which produced a fracture of the frontal bone, with but slight depression. He was treated in division hospital, was sent, via Chattanooga, to Nashville, and was admitted to hospital No. 14 on the 25th. On September 3d, he was sent to the City Hospital at Indianapolis, and on March 6th, 1865, was discharged from

service. On March 10th, 1865, Pension Examiner G. M. Mcars reported the wound entirely healed, but painful after mental or physical excitement. The patient's sight and hearing were much impaired, and he was incapacitated for any kind of work. His disability was then rated three-fourths and doubtful.

CASE.—Private George Nash, Troop L, 1st Michigan Cavalry, aged 24 years, was wounded at Dinwiddie Court House, Virginia, by a pistol ball, which caused a compound comminuted fracture of the external table of the left parietal bone near the lambdoid suture. On April 1st, he was admitted to the hospital of the cavalry corps; on April 4th, sent to the Mount Pleasant Hospital, Washington; and on May 22d, 1865, was transferred North. He was discharged May 30th, 1865, and pensioned. Pension Examiner M. L. Green reported on November 19th, 1868, that the patient suffers from impaired vision and disturbance of the cerebral functions. His disability is rated at three-fourths and permanent.

In many cases of gunshot fractures of the temporals, occipital, and parietals, partial or total deafness resulted. The following cases are examples:

CASE.—Private *F. W. Clayton*, Co. I, Palmetto Sharp-shooters, aged 22 years, a healthy and robust man, was wounded in an engagement near Petersburg, Virginia, October 7, 1864, by a conoidal ball which fractured the occipital and right parietal bones. The missile struck directly over the lambdoid suture, producing a linear fissure of the outer table, and comminuting and depressing the inner. He was insensible for twenty-four hours, but was not paralyzed. The loose spiculæ of bone were removed and simple dressings applied. The patient was sent to Richmond, where more fragments were removed as they became detached, and occasionally a disinfecting lotion was applied. On December 15th the wound had cicatrized, and the patient was sent home. For two months he had constant neuralgia of the head, face, and neck on the right side, and was a little deaf; the deafness being aggravated by the severity of the neuralgic symptoms. In March, 1866, he was perfectly healthy, but incapable of much exertion, either mental or physical. Vertigo and dizziness would attack him on suddenly stooping, or on continued excitement of mind. He could not indulge in stimulants. His deafness was gradually disappearing. The case was recorded by Surgeon F. S. Parker, P. A. C. S.

CASE.—Private William Harlin, Co. A, 116th Pennsylvania Volunteers, was wounded at Chancellorsville, May, 3d, 1863, by a piece of shell, which fractured portions of the left temporal and occipital bones. On May 6th, he was admitted to hospital of the 2d division, Second Corps; on June 14th, was sent to Point Lookout Hospital, Maryland; and on October 1st, to Mower Hospital, Philadelphia. He improved steadily, and was discharged on February 9th, 1864, and pensioned. The patient was deaf, had a constant roaring in his head, and could not bear exposure to the sun. His disability is rated one-half, and probably permanent, by Pension Examiner J. H. Gallagher, M. D.

CASE.—Private Charles Roche, Co. D, 1st Wisconsin Cavalry, aged 21 years, was wounded near Buzzard Roost, Georgia, May 8th, 1864, by a conoidal musket ball which fractured a portion of the right parietal bone. He was admitted to the hospital of the 1st division, Cavalry Corps; on May 12th he was sent to hospital No. 1, Nashville, Tennessee, and on May 16th was transferred to Clay Hospital, Louisville, Kentucky, whence he was furloughed October 23, 1864. He was readmitted November 23d, 1864, and discharged the service March 23d, 1865, on account of deafness and otorrhœa.

CASE.—Captain William H. Winsor, Co. F, 18th Massachusetts Volunteers, was wounded by a shell at the battle of Fredericksburg, December 13th, 1862, which fractured a portion of the left side of the cranium. He was admitted to the hospital of Griffin's division, Fifth Corps, and thence was sent to Washington for treatment. He resigned March 15th, 1863. The power of hearing was somewhat impaired.

CASE.—Private Peter Peterson, Co. D, 100th Illinois Volunteers, aged 24 years, was wounded in the head, at the battle of Chickamauga, Georgia, September 19th, 1863, by two balls; the first lodging between the tables of the frontal bone near the vertex; the second taking effect in the left parietal and occipital bones, causing fracture without known depression. On September 21st, he was admitted to the field hospital at Chattanooga, where he remained under treatment until October 3d, when he was taken to Stevenson, Alabama; thence he was transferred, on October 12th, to hospital No. 14, Nashville. On January 19th, 1864, he was sent to the Marine Hospital, Chicago, Illinois, and was discharged from service on April 2d, 1864, and pensioned. On April 20th, 1864, Pension Examiner J. McCann reports that the wound has healed, leaving an indentation in the skull, and that the patient's hearing is imperfect. His disability is rated three-fourths and permanent.

CASE.—Private James Fitzgerald, Co. C, 81st New York Volunteers, aged 29 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball which entered the anterior part of the right squamo-parietal suture, passed downward and backward, and cut off the right ear. He was admitted to the hospital of the 1st division, Eighteenth Corps, and was transferred, on June 8th, to the 2d division hospital, Alexandria, and on June 12th, to the hospital at Chester, Pennsylvania. He was discharged January 3d, 1865, and pensioned, owing to deafness in the right ear, headache, and dizziness, which partially incapacitated him for work. His disability is rated one-fourth and temporary.

CASE.—Private Charles Rowe, Co. K, 139th New York Volunteers, aged 21 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball, which fractured a portion of the left parietal bone. On the same day, he was admitted to the field hospital of the Eighteenth Corps, and transferred as follows: on June 8th, to the Fairfax Seminary Hospital; on June 29th, to the McClellan Hospital, Philadelphia; on December 10th, to the Filbert Street Hospital; and on May 12th, 1865, to the Satterlee Hospital, where he was discharged on June 16th, 1865, and pensioned. On October 30th, 1865, Pension Examiner Charles Rowland reported the patient suffering from partial deafness, constant pain in the head, and impaired memory. He rates his disability one-half, and temporary.

CASE.—Private Richard Ridgely, Co. H, 54th Massachusetts Volunteers, (colored,) was wounded in the engagement at Olustee, Florida, February 20th, 1864, by a conoidal musket ball which entered the left ear and passed through the mastoid process. On February 22d he was admitted to the hospital at Jacksonville, Florida, and on February 26th he was sent to the hospital at Beaufort, South Carolina, at which time there was some discharge from the ear and pain in the head, with obstinate

constipation. The patient was treated on the expectant plan, under which there was marked improvement by March 31st, and on July 10th, 1864, he was returned to duty, though still deaf.

CASE.—Private R. W. Wilder, Co. H, 7th New York Volunteers, was wounded at Fredericksburg, December 13th, 1862, by a conoidal musket ball which passed from behind forward through the mastoid process and the concha. He also received a wound in the right side of the abdomen, near the terminal costal cartilages. The patient was conveyed to the hospital of the 1st division, Second Corps, where cold water dressings were applied. On December 20th he was sent to Lincoln Hospital, Washington, and on January 17th, 1863, was transferred to the Howard Hospital. He recovered, except from the deafness of the right ear, and was returned to duty on April 11th, 1863.

CASE.—Private *William Thompson*, Co. B, 48th Georgia Regiment, received a gunshot fracture of the head at the battle of Chancellorsville, May 3d, 1863. He was admitted to hospital No. 16 at Richmond, and recovered, with the exception of defective audition of the left ear. He was allowed to go home on June 6th, 1863.

In the following case the sense of taste was lost as well as the sense of hearing:

CASE.—Sergeant William B. Hutchinson, Co. F, 12th New Jersey Volunteers, was wounded at Chancellorsville, Virginia, May 3d, 1863. The missile entered in front of the external meatus, and lodged in the internal ear. He was admitted to the hospital of the 3d division, Second Corps; on May 9th, was sent to Carver Hospital, Washington, and on June 27th, to South Street Hospital, Philadelphia, whence he was discharged the service, April 6th, 1865, and pensioned. The ball remained in the wound, and could be felt in its place of lodgment. The sense of hearing was completely lost in the injured ear, and the patient had lost the sense of taste and suffered from vertigo.

Balls Splitting on the Cranial Bones.—Military surgeons have long known that it was not very uncommon for musket balls impinging obliquely upon the skull to be split. According to the velocity of the ball, it would be partially or completely divided. In the former case the missile would remain astride, as it were, of the wall of the skull; in the latter, one fragment would penetrate into the brain cavity and the other would fly off or lodge under the aponeuroses or scalp. Larrey and Hennen and Guthrie refer to such instances. It was believed by Macleod and others that with the general introduction of the conoidal ball, such forms of injury would be seldom observed; but experience has shown that, when moving at a low rate of velocity, the elongated ball is as liable to split on striking sharp angles of bone as the round ball. Mr. Wall, surgeon of the 38th, and Dr. Longmore, of the 19th British regiments, record[1] examples from the Crimean campaign of conical balls splitting on the cranial bones. The Army Medical Museum possesses many such specimens. In addition to those referred to at page 163 and page 170 of this work, the histories connected with a few others of the more interesting specimens may be noted:

CASE.—Lieutenant Charles W. Burd, Co. F, 4th Maine Volunteers, aged 26 years, was admitted to the Hygeia Hospital at Old Point Comfort, Virginia, on February 20th, 1862, from the prison in Richmond in which he had been incarcerated. He had been struck at the first battle of Bull Run, July 21st, 1861, on the left side of the frontal bone by a round musket ball, and was supposed by his comrades to have been mortally wounded. He was made a prisoner and conveyed to Richmond. A projection was felt under the scalp about four inches from the wound in the integument and an incision was made over it, from which half a bullet with a polished cut surface was extracted. He remained seven months at Richmond, during which time the wound in his forehead continued open and suppurated freely. On his release he was examined at the hospital at Fort Monroe, by Surgeon John M. Cuyler, U. S. A., who discovered a metallic substance deep in the wound, after dilating the small fistulous opening by tents and an incision upward. The foreign body was extracted and proved to be a portion of the ball having imbedded in it a small fragment of bone. On February 27th, after repeated efforts, the remainder of the ball was extracted and a piece of the inner table of the skull which had been driven before the ball was also removed. It was found that the ball having split upon the external table, and one-half passing inward, impinged against the inner table, and again was nearly divided and firmly embraced a portion of the inner table in the fissure thus formed. On February 28th two pieces of the inner table which had been driven down before the ball, were extracted, one measuring ten lines in length and five lines in breadth, the other piece was small. The patient afterwards came under the care of Dr. John Mason Warren, of Boston, who has printed an account of the case in his instructive work.[2] The case is also reported in the surgical report in Circular 6, of this Office, for 1865.[3] Lieutenant Burd recovered and rejoined his regiment and served during the war, and was mustered out on August 2d, 1866, and pensioned. Pension Examiner John G. Brookes reports in July, 1867, that this officer had fullness and giddiness of the head, and some pain and mental dullness if he took cold. He resided at Belfast, Maine, and his disability was rated at three-fourths and permanent. The history of the case is compiled from various sources, the notes at Fort Monroe being recorded by Medical Cadet Charles A. Devendorf, U. S. A.

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[1] *Addenda to the Sixth Edition of Guthrie's Commentaries*, p. 642, *et seq.*

[2] WARREN, *Surgical Observations and Cases*, Boston, 1867, p. 543. [3] Circular No. 6, S. G. O., 1865, p. 18.

Case.—Corporal John N——, aged 18 years, Co. H, 159th New York Volunteers, was struck on the left side of the forehead, on April 14th, 1863, an in engagement at Irish Bend, Louisiana, by a round musket ball. He was admitted to the University Hospital, at New Orleans, on April 17th. The ball had been removed on the field. Several depressed fragments of bone were removed, and cold water dressings were applied. The case progressed without a bad symptom until April 30th, when there were clonic spasms, which, after a few hours, were followed by a semi-comatose condition, which continued until death, on May 2d, 1863. A necroscopic examination revealed extensive meningitis, and a large abscess of the left cerebral hemisphere. The lateral ventricles were filled with sero-purulent matter. The surfaces of the pons Varolii and of the medulla oblongata were covered with lymph. The specimen was forwarded by Assistant Surgeon P. H. Conner, U. S. A., and is represented in the adjacent wood-cuts, (Fig. 93 and Fig. 94.)

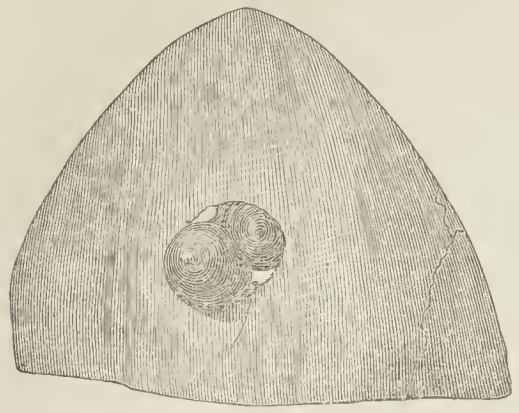

Fig. 93.—Section of a frontal bone, with a split musket ball impacted at the left frontal eminence. *Spec.* 1293, A. M. M.

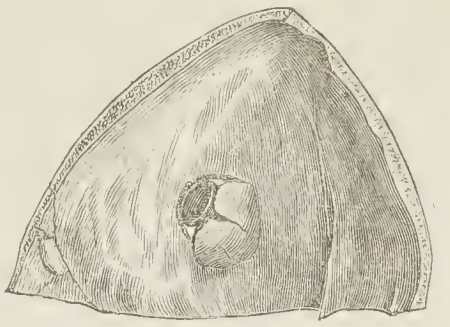

Fig. 94.—Interior view of specimen No. 1293, A. M. M.

Case.—Private C. C. W——, Co. I, 6th Wisconsin Volunteers, aged twenty-one years, was wounded at Spottsylvania, May 12th, 1864, and was taken to the field hospital of the 4th division of the Fifth Corps, and after the application of cold lotions to the scalp, was sent to City Point, and thence to Washington, where he was admitted into Douglas Hospital four days after the reception of the injury. Here it was ascertained that the cranium was fractured; but the symptoms were not urgent, being limited to slight paralysis of the right upper extremity, and operative interference was deferred. On May 31st a conoidal musket ball and several fragments of the left parietal were removed by Assistant Surgeon W. F. Norris, U. S. A. One large fragment of the vitreous plate was pressing on the dura mater; and this was elevated and removed. The next day, symptoms of compression of the brain were manifested. An exploration of the wound was made, and a quantity of pus was evacuated. On June 4th, 1864, twenty-three days after the injury, the case terminated fatally. At the autopsy the arachnoid was found little altered. There was an abscess in the posterior lobe of the left hemisphere, near the longitudinal sinus, of the size of a walnut, with walls of a greenish-yellow color, and communicating with the lateral ventricle. The right ventricle was filled with sero-sanguinolent fluid. There was a deposition of lymph at the base of the brain, extending from the medulla oblongata to the optic commissure. The specimen and facts connected with it were contributed by Assistant Surgeon William Thomson, U. S. A. The inner surface of the left parietal, near the fracture, is carious. Externally both parietals present over their entire surface the traces of the results of periostitis.

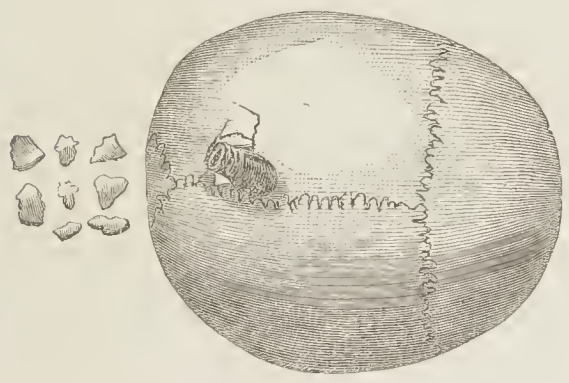

Fig. 95.—Skull-cap, fractured near the vertex, by a musket ball which has split. *Spec.* 3543, Sect. I, A. M. M.

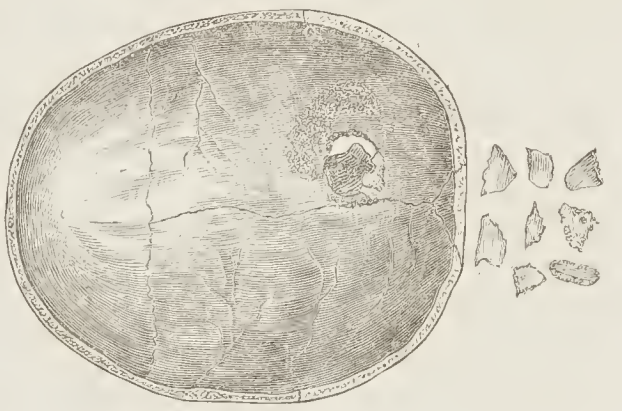

Fig. 96.—Interior view of the specimen, No. 3543, A. M. M.

Case.—Sergeant J. N. H——, Co. K, 19th Maine Volunteers, aged 36 years, was struck on the right side of the head by a musket ball, in a skirmish at Morton's Ford, on the Rappahannock, February 6th, 1864. The ball was smoothly cut in two, one half lodging under the scalp, and the other passing into the brain. The patient was perfectly rational until February 11th, when his mind wandered at times. On the 12th, Surgeon Justin Dwinelle, 106th Pennsylvania Volunteers, extracted the fragment of the ball which had buried itself in the brain. Its track communicated with the right lateral ventricle. The other portion of the ball had been removed from under the scalp immediately after the injury. When the patient recovered from the influence of the chloroform, he was rational, and continued so for twenty-four hours or more; but coma came on gradually, and death took place on February 15th, 1864. The left ventricle was found filled with pus. The specimen was contributed by Dr. Dwinelle, and is figured in the adjacent wood-cuts, (Figs. 97 and 98.)

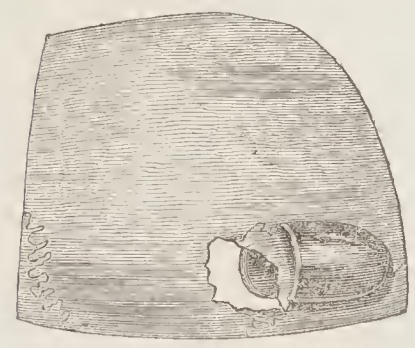

Fig. 97.—Section of right parietal on which a conoidal musket ball has split. *Spec.* 2121, Sect. 1, A. M. M.

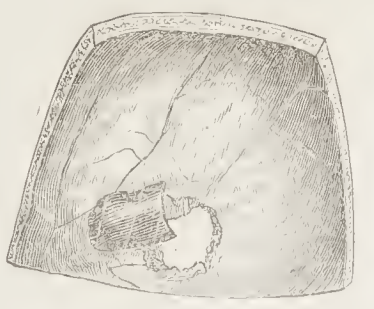

Fig. 98.—Interior view of specimen 2121, Sect. I, A. M. M.

CASE.—Sergeant Simon B. Scholl, Co. E, 82d Pennsylvania Volunteers, aged 21 years, was wounded at the battle of Spottsylvania, May, 1864, by a musket ball which penetrated and fractured the frontal bone a little to the left of and involving the median line, making an opening three-fourths by one-half inch; then split into two parts, one of which lodged beneath the scalp at a corresponding point on right side, the other splintered the crista galli in its course and lodged just over the ethmoidal cells, the roof of which it partially destroyed. The patient was insensible a short time previous to being admitted to the 3d division of the Sixth Corps Hospital. On May 24th he was sent to Mount Pleasant Hospital, Washington, and on May 30th to Cuyler Hospital, Philadelphia. On admission to the latter hospital he was much exhausted and depressed, becoming towards evening feverish, with pain in head. A portion of the ball was removed from beneath the scalp by counter opening. For two weeks the only prominent symptoms were headache, constipation, and vomiting, followed afterward by insomnia and great jactation. On June 18th the patient became almost completely comatose. He could be aroused only with difficulty and relapsed almost immediately. The left pupil became contracted, while the right was widely dilated, both being insensible to light. He died June 18th, 1864. At the autopsy the membranes were found to contain a fine arterial injection, the venous trunks also being considerably engorged. The brain presented a moderate degree of interstitial congestion. A large abscess was found in the lower part of the anterior lobe of the right hemisphere, containing about three ounces of greenish, flocculent pus, mingled with broken-down brain substance. Several spiculæ of bone were found penetrating the membranes, and a small clot of coagulable lymph showed at once the original seat of injury, and the point at which suppuration had begun. A point of interest in this case was the rudimentary state of the frontal sinus, an anatomical variation from the customary condition, to which may probably be attributed the fatal result, since the portion of the ball which in this case penetrated the cranium, would in an ordinary skull have lodged in the frontal sinus. The case is reported by Assistant Surgeon Henry S. Schell, U. S. A.

CASE.—Private Thomas Spratt, Co. G, 2d California Cavalry, was wounded in Owens' Valley, California, April 10th, 1863, while fighting Indians, by a two and a quarter ounce ball, which entered the skull one inch and a quarter above the outer angle of the right eye, driving fragments of bone into the brain. The missile split, one part going beneath the scalp for one inch, and the remainder entering the brain. At the end of April, 1863, the patient was walking about, doing well. He was discharged September 27th, 1864, and his name does not appear on the pension list. The case is reported by Assistant Surgeon G. H. Horn, 2d California Cavalry.

The following patients, with depressed gunshot fracture of the cranium, recovered without any disability, and were returned to duty:

CASE.—Private John Woods, Co. H, 63d Pennsylvania Volunteers, aged 29 years, was wounded at the battle of Bull Run, Virginia, August 29th, 1862, by a buckshot which fractured and depressed the right frontal eminence, causing a wound of the scalp about an inch in extent, to which cold water dressings were applied. The patient was sent to Philadelphia, and was admitted into the Broad and Cherry streets Hospital, his general condition being good. The case progressed satisfactorily until September 9th, when the patient was seized with violent headache, followed by convulsions, insensibility, and stertorious breathing. At the end of twenty-four hours consciousness returned; his intellect, however, remained dull. Twice subsequently convulsions of a few minutes duration occurred. The wound healed rapidly, and about the end of October a hard substance was observed beneath the integuments near the seat of injury, which was removed, and proved to be a flattened buckshot. The patient was returned to duty December 14th, 1862. The case is reported by Acting Assistant Surgeon John Neill.

CASE.—Private Jasper S———, 18th Missouri Volunteers, received at the battle of Shiloh, Tennessee, April 6th, 1862, a gunshot fracture of the os frontis, a little above and back of the frontal eminence, the bone being depressed half an inch and the size of the ball. He was insensible when brought to the hospital. With expectant treatment, quiet, and low diet, he became rational, and in less than three weeks recovered his usual health. Assistant Surgeon G. B. Houts, 18th Missouri Volunteers, reports the case, and adds that on his return from the army he saw S———, and learned that the latter had not suffered from any cerebral trouble after his discharge from service.

CASE.—Sergeant Joseph Demaro, Co. E, 5th Vermont Volunteeers, aged 23 years, was wounded in an engagement near Funkstown, Maryland, July 10th, 1863, by a conoidal musket ball which apparently produced a trivial wound of the scalp on the right side of the head. He was sent to the hospital at Point Lookout, and on the 10th of August was transferred to the Brattleboro' Hospital in Vermont. It was now evident that the skull was fractured and measurably depressed. The treatment, as far as recorded, consisted chiefly in the application of simple dressings to the wound. No unfavorable symptoms occurring, the patient was returned to duty October 12th, 1863. He is not on the Pension List.

The following patients with depressed gunshot fracture of the cranial bones, recovered with but slight disability and were transferred to the Veteran Reserve Corps, or furloughed, or discharged on the expiration of their terms of service:

CASE.—Private John T. Brown, Co. A, 86th Illinois Volunteers, aged 18 years, was wounded near Rome, Georgia, May 17th, 1864, by a buckshot which fractured the frontal bone at the superciliary ridge above the internal angle of the left orbit causing a slight depression. He was sent to the hospital of the 2d division, Fourteenth Corps, and on June 2d was sent to the hospital at Nashville, Tennessee. On June 4th he was transferred to the Joe Holt Hospital, Jeffersonville, Indiana; thence was sent to Jefferson Barracks Hospital, St. Louis. Lead-water dressings had been applied to the wound during this time. On the 9th of July he was sent to Quincy, Illinois, suffering pain in the frontal region. He was unable to endure the

heat of the sun but his appetite was good. His health continued fair, though he experienced occasional headache. On February 13th, 1865, he was transferred to the 1st battalion Veteran Reserve Corps. The case is reported by Surgeon D. G. Brinton. He is not on the Pension List.

CASE.—Sergeant Richard M. Cunningham, Co. D, 21st Iowa Volunteers, aged 39 years, was wounded at the battle of Port Gibson, Mississippi, May 1st, 1863, by a conoidal ball which fractured the os frontis, slightly depressing the cone. He was admitted to the Van Buren hospital, Milliken Bend, Louisiana, and on August 11th sent to the hospital steamer C. McDougall. The case progressed favorably and by the 17th of August the wound in the scalp had nearly healed. The patient's mind was unimpaired and his general health good. On August 18th he was admitted to the convalescent hospital, Benton Barracks, Missouri, and thence sent to duty in the Veteran Reserve Corps, on November 28th, 1863. The case is reported by Acting Assistant Surgeon Thomas Evans. This man was discharged from service June 29th, 1865, and pensioned. On December 16th, 1867, Pension Examiner A. B. Hanna, reports him suffering from cephalalgia, vertigo, and discharge of pus from the left ear.

CASE.—Private James L. Adams, Co. D, 11th Illinois Volunteers, received, at the battle of Jonesboro', Georgia, September 1st, 1864, a wound of the head from a shell fragment, with fracture of the right side of the frontal bone with slight depression. He was admitted into the field hospital of the 2d division, Fourteenth Army Corps, and about October 28th he was admitted into the No. 15 Hospital, Nashville. He was mustered out of service June 8th, 1865. On October 9th, 1869, Pensioner Examining Surgeon G. S. Owen, reported that this patient, whose claim for a pension was still pending, became partially insane if he attempted to labor and rated his disabilities at three-fourths and permanent.

CASE.—Private Fielding Parsons, Co. D, 11th West Virginia Volunteers, aged 26 years, was wounded at the battle of Winchester, Virginia, September 19th, 1864, by a conoidal musket ball which entered the frontal bone above the left eye and lodged, producing a fracture and depression. He was sent to a field hospital; thence was conveyed by way of Sandy Hook and Baltimore to York, Pennsylvania, where he was admitted into the general hospital on October 4th. The patient was returned to duty on October 28th, 1864; but on November 1st he was again admitted to the general field hospital at Parkersburg, West Virginia, where the missile was extracted. Having deserted on February 24th, 1865, nothing was known of him until May 27th, when he was admitted from the Soldiers' Rest Hospital into the Sickles' Barracks Hospital at Alexandria, Virginia. He was discharged the service on July 6th, 1865, in obedience to General Order No. 77, A. G. O., War Department, and in 1868 was pensioned, his disability being rated at three-fourths and temporary. The case is reported by Surgeon E. Bentley, U. S. V.

CASE.—Private John Lovewell, Co. A, 188th New York Volunteers, aged 42 years, was wounded at the battle of South Side Railroad, Virginia, October 27th, 1864, by a conoidal musket ball which fractured and depressed a portion of the frontal bone over the right superciliary ridge. He was admitted into the 1st division, Fifth Corps hospital; thence was conveyed to Washington, and admitted on the 30th into Emery Hospital. The patient was furloughed in December and returned to duty April 4th, 1865. Being still unfit for duty, he was admitted two days afterward into the Sickle's Barracks at Alexandria, and was finally discharged the service June 3d, 1865, and pensioned, his disability being rated temporary.

CASE.—Private *W. M. Taylor*, Co. K, 10th Alabama Regiment, was wounded on July 2d, 1863, by a grape-shot which fractured and depressed a portion of the frontal bone. He was admitted into the 2d division of the Alabama Hospital at Richmond, and on July 22d he was furloughed.

CASE.—Private Timothy Donovan, Co. H, 29th Maine Volunteers, aged 24 years, was wounded at the battle of Cedar Creek, Virginia, October 19th, 1864, by a piece of shell which fractured the external table of the frontal bone to the left of the median line. On October 22d he was admitted to the Satterlee Hospital, Philadelphia, where expectant treatment was used, under which the wound healed rapidly, and on January 18th, 1865, the patient was transferred to the Veteran Reserve Corps. He was discharged the service September 19th, 1865, because of general debility and headache, and was pensioned, his disability being rated one-half, and its probable duration as doubtful.

The following patients, with gunshot depressed fractures of the cranial bones, died from compression of the brain, following the injury, and produced by extravasation of blood within the skull. Their cases presented no marked peculiarities:

CASE.—Private John Ernst, Co. C, 35th Iowa Volunteers. Gunshot fracture of frontal bone. Vicksburg, Mississippi, June 8th, 1863. Conoidal musket ball. Treated at Fifteenth Corps hospital. Died June 12th, 1863.

CASE.—Corporal W. Johnson, Co. H, 15th Wisconsin Volunteers, aged 30 years. Gunshot fracture of frontal bone by conoidal musket ball. Resaca, Georgia, May 14th, 1864. Treated in hospital No. 1, at Nashville. Died June 16th, 1864.

CASE.—Private Joseph Warwick, Co. A, 26th Michigan Volunteers, was wounded at the battle of Mine Run, Virginia, November 27th, 1863, by a conoidal ball which struck in the centre of the forehead and apparently penetrated the bone. He was sent to the hospital of the 1st division, Second Corps, thence was conveyed to Alexandria, and on December 4th was admitted to the 1st division hospital in a state of insensibility. Consciousness never returned, and death ensued December 6th, 1863.

CASE.—Private *A. B.*———, a Confederate soldier, was wounded at the siege of Fort Donelson, February 16th, 1862, by a musket ball which entered the skull at the right frontal eminence. He was conveyed to Nashville, and on the evening of February 18th was admitted to the Academy Hospital. He suffered no pain and was even cheerful. Confederate Surgeon

Madden after having anæsthetized the patient explored the wound. Upon making a crucial incision a large depression was disclosed. He failed to detect any foreign substance either with the probe or fore-finger, which was introduced in the direction of the left parietal eminence. Reaction was prompt, and a few hours after the patient was about the wards. He took his supper with relish and slept well during the night. On awaking, however, he complained of pain in the head which steadily increased. There were no symptoms of delirium. Death occurred February 22d, 1862. The case is reported by Surgeon Eben Swift, U. S. A.

Case.—Private Charles Braithwait, Co. F, 22d Wisconsin Volunteers, aged 20 years. Gunshot fracture and depression of frontal bone. Marietta, Georgia, June 25th, 1864. Treated at Twentieth Corps and Chattanooga hospitals. Died July 27th, 1864.

Case.—Corporal H. Louth, Co. F, 27th Michigan Volunteers. Gunshot fracture of frontal bone with depression, by a shell fragment. Petersburg, Virginia, June 17th, 1864. Treated at field hospital. Died June 19th, 1864.

Case.—Private T. A. Brockway, Co. G, 16th Michigan Volunteers. Gunshot depressed fracture of the frontal bone. Treated at Fifth Corps hospital. Died May 12th, 1863.

Case.—Charles Mervin, a seaman of the gunboat Pittsburg, was wounded at the siege of Fort Donelson, February 14th, 1862, by a piece of shell which struck the right frontal eminence. He walked from the boat to the hospital at Mound City, where he arrived February 20th. The injury being considered slight, he seemed to do well until four o'clock P. M. on February 24th, when he was seized with nausea and vomiting, which were followed by delirium and death. At the *post-mortem* examination an extensive fracture with depression of the internal table was revealed, and a spiculæ of bone was found driven into the substance of the brain. A clot was found between the calvaria and dura mater. There was a fissure two inches long in the outer table; but the pericranium was unbroken.[1]

The following are examples of intra-cranial abscesses following depressed gunshot fractures of the skull:

Case.—Private Thomas Bradley, Co. B, 6th New Hampshire Volunteers, aged 43 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball which fractured and depressed the frontal bone at the median line and lodged under the aponeurosis. He was admitted on the 7th into the 1st division hospital at Alexandria, where the missile was extracted on the 13th. Death resulted on June 23d, 1864. The autopsy revealed an abscess between the dura mater and the brain, near the seat of fracture, and on section a considerable extravasation of fluid was found in the ventricles. The case is reported by Surgeon E. Bentley, U. S. V.

Case.—Private John J. Griffith, Co. H, 107th New York Volunteers, aged 24 years, received, near Atlanta, Georgia, July 28th, 1864, a gunshot fracture of the skull. The missile entered over the left eye at the superciliary ridge, fracturing the os frontis for two inches. He also received, in the same engagement, a wound of the hand. He was immediately admitted to the hospital of the 1st division, Twentieth Corps, where the forefinger was amputated. On August 2d, he was sent to the field hospital at Chattanooga, where he died on August 21st, 1864. At the autopsy, an abscess about the size of a hen's egg was found immediately beneath the fracture. The left arachnoid cavity was filled with cream-like pus. At the base of the brain twelve ounces of straw-colored fluid were discovered. The ventricles were distended with the same fluid.

Case.—Lieutenant Charles L. F———, Co. K, 6th New Hampshire Volunteers, was wounded at the battle of Bull Run, Virginia, August 29th, 1862, by a musket ball which penetrated the squamous portion of the temporal bone. He was conveyed to Washington, and admitted to Carver Hospital, where he died on September 14th, 1862. The autopsy revealed fragments of bone pressing upon the dura mater, and also a collection of pus in the vicinity of the wound. The pathological specimen is No. 139, Section I, A. M. M. Portions of the ball remain imbedded in the depressed fragments of the bone. Three fragments remain in *situ*, two of which are depressed about one-fourth of an inch. The specimen was contributed by Surgeon O. A. Judson, U. S. V.

Case.—Private Charles O. Homan, Co. D, 92d New York Volunteers, aged 22 years, was wounded near Kinston, North Carolina, December 14th, 1862, by a missile, which fractured the squamous portion of the temporal bone, driving a spicula of bone through the dura mater, and lodged in the posterior border of the right temporal muscle, whence it was extracted soon after. He was conveyed to New Berne, and on December 21st was admitted to Stanley Hospital. His condition was bad. He lingered in much pain and in a semi-conscious condition until December 28th, when delirium set in, which continued with intervals of remission until death occurred, December 29th, 1862. At the autopsy, the vessels of the cephalic membrane were found to be injected with more than thrice the usual amount of blood. One-third of the right cerebral hemisphere appeared softened, and a diffused abscess containing six drachms of pus lay directly under the seat of injury, extending down to the petrous portion of the temporal bone. The case is reported by Surgeon J. Baxter Upham.

Case.—Private William Nash, Co. G, 46th Ohio Volunteers, received, at the battle of Dallas, Georgia, May 27th, 1864, a gunshot fracture of both tables of the frontal bone, a little to the left of the junction of the coronal with the sagittal suture. He was admitted to the field hospital, Fifteenth Corps, and experienced only little trouble from the wound until June 4th, when a convulsion occurred. From that time he remained in a semi-comatose condition until death, which took place June 19th, 1864. The autopsy revealed, a little posterior to the fracture, an abscess, which extended into the convolutions of the brain. The gray substance was destroyed for a distance of one and a half inches. The case is reported by Surgeon D. J. Swarts, 100th Indiana Volunteers.

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[1] This case is also reported in Franklin's *Science and Art of Surgery*, St. Louis, 1867. Vol. I, p. 696.

CASE.—Private Aaron Jones, Co. F, 14th Vermont Volunteers, aged 36 years, received at the battle of Gettysburg, Pennsylvania, July 3d, 1863, a gunshot fracture, with slight depression of the frontal bone near the median line, and equidistant from its junction with the vertex and nasal bones. He was admitted to Camp Letterman, and on July 13th sent to Fort Wood, New York Harbor. The patient stated that after the first shock of the blow he felt no special inconvenience other than would naturally result from a simple flesh wound. Until July 16th the patient was apparently very comfortable; he slept well, ate with a relish, and conversed intelligently. On the morning of that day he suddenly fell into a semi-comatose condition, characterized by hard and labored breathing, dilated pupils, and at times slight, irregular convulsive movements of the limbs. He seemed unconscious to all external impressions, and at long intervals would take a deep inspiration, open his eyes, look furtively around, and then relapse into his former condition. Counter-irritation was applied to the spine and extremities, but without effect. Death resulted July 17th, 1863. At the autopsy, a wide spicula of bone was found standing off from the plane of the surface of the inner table. There was an extensive suffusion of pus over the meningeal surfaces, immediately adjacent and around the point of fracture; but no burrowing had taken place, and the brain substance was perfectly healthy. The bone at seat of fracture was very thick and firm, and notwithstanding the powerful blow he must have received, there were no symptoms of concussion. The case is reported by Acting Assistant Surgeon O. W. Gibson.

CASE.—Private M. S———, Co. F, 86th New York Volunteers, aged 25 years, was wounded at the battle of Beverly Ford, Virginia, June 9th, 1863, by a musket ball, which fractured the squamous portion of the left temporal bone. He was conveyed to Washington, and was admitted to the Lincoln Hospital on June 10th, where water dressings were applied. Death occurred on June 28th, 1863. Autopsy: The fracture, which had radiating fissures, commenced one and a half inches anteriorly to the left ear and extended one inch posteriorly, the opening being filled with disorganized brain. Upon the removal of the calvaria, the left hemisphere was observed to be of a dark slate color, while the appearance of the right was natural. The dura mater was lined with a dark unhealthy fluid. Pus also was found in the arachnoid cavity on the left side. The pia mater was not affected. The inferior portion of the middle cornu was disorganized, and had doubtless been involved in the injury. Pus was found upon the superior surface of the cerebellum on both sides. The pathological specimen is No. 1344, Sect. I, A. M. M., and shows the vault of the cranium, with the line of section through the fractured bone, of which only the upper part is apparent. The specimen and history were contributed by Surgeon G. S. Palmer, U. S. V.

Erysipelas.—Allusion has been made on pp. 77 and 101 to the comparatively small proportion of cases of erysipelas that were observed in gunshot scalp wounds and contusions of the cranial bones, and the remark is equally applicable to gunshot depressed fractures of the skull. This complication was reported in but three of three hundred and sixty-three cases of depressed gunshot fracture of the skull:

CASE.—Sergeant Byron W. Worden, Co. D, 29th Indiana Volunteers, received at the battle of Chickamauga, September 19th, 1863, a gunshot depressed fracture of the left side of the head. On October 1st he was admitted to the hospital at Chattanooga. Erysipelas supervened, but the case progressed favorably, and on November 19th the patient was returned to duty. Not on Pension List.

CASE.—Private *Daniel B. Harold,* Co. C, 21st Virginia Regiment, was wounded at Gettysburg, July 2d, 1863, and died January 7th, 1864, at Point Lookout Hospital, from erysipelas following gunshot depressed fracture of right parietal.

CASE.—Private Hutchinson Miller, Co. H, 29th U. S. Colored Troops, aged 40 years, was wounded in the engagement at Chapin's Farm, Virginia, October 13th, 1864, by a conoidal musket ball, which produced a depressed fracture of the parietal. On the same day, he was admitted to the field hospital of the Tenth Corps, and thence was sent to the general hospital at Fort Monroe, where he was admitted on the 14th, and died on February 24th, 1865, from traumatic erysipelas.

Caries and Necrosis—The following are cases of caries, or necrosis, following gunshot injuries of the cranial bones:

CASE.—Private Andreas Baumgartner, Co. K, 82d Illinois Volunteers, aged 42 years, was wounded at Chancellorsville, May 2, 1863, by a round ball, which fractured the upper portion of the occipital bone. In the same engagement he received a gunshot wound of the left orbit. On May 15th, he was admitted to the hospital of the 3d division, Eleventh Corps; on June 15th, he was sent to Lincoln Hospital, Washington, and on January 1st, 1864, was sent to the Marine Hospital, Chicago, Illinois. He was discharged on May 5th, 1864. In December, 1869, it was reported by Pension Examiner J. D. Howell that there was necrosis of both tables of the skull, leaving the patient with persistent pain and vertigo, and general constitutional disturbance, which rendered him unable to earn a livelihood. Dr. Howell rated his disability at three-fourths.

CASE.—Sergeant William F. De Forrest, Troop M, 2d Massachusetts Cavalry, was wounded at Ashby's Gap, Virginia, July 12th, 1863, by a conoidal musket ball, which entered the right temple just above the eye, and remained in the wound for two months. No further record of the case is on file until December 30th, 1863, when the patient was admitted to the Ira Harris Hospital, Albany, New York. He was discharged September 4th, 1864, and pensioned on November 1st, 1864. Pension Examiner S. D. Willard reported that there was necrosis of the frontal bone, headache, mental impairment, and inability to bear exposure to the sun, which incapacitated the patient from earning a livelihood. His disability was rated three-fourths and temporary.

CASE.—Corporal Joseph E. French, Co. E, 63d New York Volunteers, aged 30 years, was wounded at the battle of Cold Harbor, Virginia, June 5th, 1864, by a fragment of shell, which fractured the frontal bone. On the 9th, he was admitted to the Fairfax Seminary Hospital, Virginia; on the 11th, was transferred to the West's Building Hospital, Baltimore, and on July 11th

was sent to the Second Division Hospital at Annapolis. He was furloughed in August, and on January 27th, 1865, was discharged from service on surgeon's certificate of disability and pensioned. A communication from Pension Examiner C. H. Dana, dated April 29th, 1867, stated that the wound discharged freely and was very offensive. There was ptosis of the right eye-lid, and the patient suffered from frequent attacks of headache and vertigo. His disability was rated total and permanent.

Case.—Private John Mallon, Co. F, 100th Illinois Volunteers, was wounded at the battle of Chickamauga, Georgia, September 20th, 1863, by a fragment of shell, which lacerated the scalp and fractured the left parietal bone, causing but slight depression. He was taken prisoner, after a few days was paroled, and on October 6th was admitted to the hospital at Stevenson, Alabama; thence he was conveyed to Nashville, and on the 17th was admitted to hospital No. 19. In November he was furloughed, and afterward received into the Marine Hospital, Chicago, on November 25th, 1863. Caries of the skull ensued and still existed at the time of his discharge from service, June 9th, 1864. In a communication dated January 7th, 1868, the Commissioner of Pensions states that Mallon is a pensioner, and that his disability is rated one-half and temporary. Further information, dated March 4th, 1870, and signed by three members of an examining board, shows that the wound was still discharging, that the patient was losing his memory, and that his disability was rated one-half and permanent.

Case—Corporal Nicholas King, Co. F, 18th Kentucky Volunteers, aged 19 years, was wounded at the battle of Chickamauga, September 19th, 1863, by a fragment of shell, which fractured a portion of the frontal bone at the right superciliary ridge. He was taken prisoner, conveyed to Richmond, exchanged about the 24th of March, 1864, was admitted to the Second Division Hospital at Annapolis, was transferred to the Chase Hospital at Columbus, Ohio, and was discharged the service May 17th, 1864. There was caries of the bone and purulent discharge from the nose. On August 8th, 1865, Pension Examiners Corlis and Feris reported that there was still discharge and exfoliation of bone from the wound, attended with great pain and disability. On August 14th, 1865, he was pensioned, his disability being rated total and permanent.

Case.—Private Owen Huggins, Co. C, 10th Vermont Volunteers, aged 50 years, was wounded before Petersburg, Virginia, March 25th, 1865, by a conoidal ball, which fractured the left parietal bone. He was admitted to the hospital at City Point, on the same day; on April 5th, was sent to the Fairfax Seminary Hospital; on April 12th, he was sent northward, and on the 15th, was admitted to the Sloan Hospital at Montpelier. He was discharged the service June 28th, 1865, and pensioned. The wound had not closed, and some necrosed bone remained undetached. On March 28th, 1868, Pension Examiner G. W. Vanderhull reported that the bone was necrosed and depressed. The patient suffered from pain in the head with loss of memory. His disability was rated total and permanent.

Case.—Private *John Thompson*, Co. H, 14th North Carolina Regiment, aged 22 years, was wounded by a projectile on May 3d, 1863, which fractured a portion of the frontal bone. Necrosis ensued. On February 20th, 1865, he appeared before an examining board at Raleigh, when he was retired as permanently disabled and unfit for duty in any branch of the service.

Case.—Private Owen McDermott, Battery K, 4th U. S. Artillery, aged 28 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a conoidal musket ball, which struck about two inches above the left eyebrow, and slightly fractured the frontal bone. On May 17th, he was admitted to St. Aloysius Hospital at Washington. On October 17th, he was sent to Harewood Hospital, and was discharged on November 17th, 1863. He re-enlisted in Co. I, 8th New Jersey Volunteers, and, after the battle of Deep Bottom, Virginia, was conveyed from City Point to the Beverly Hospital, New Jersey, which he entered August 21st, 1864. On April 4th, 1865, he was transferred to the Satterlee Hospital at Philadelphia, and was discharged from service on July 19th, 1865. From injury to periosteum, slight caries exists in the vicinity of the wound, which maintains an almost constant suppurative discharge. In October, 1868, he was a pensioner.

Case.—Private *A. J. Richards*, Letcher's Battery, Pegram's Battalion, aged 18 years, received, in an engagement on the Weldon Railroad, Virginia, August 16th, 1864, a gunshot fracture of the right parietal bone. He was admitted to the 3d division, Chimborazo Hospital, Richmond, on the 22d, and on March 3d, 1865, was retired by an examining board. Caries and necrosis existed, and he suffered constant pain in the head, by which he was permanently disabled and unfitted for any duty.

Case.—Private P. Smith, Co. I, 91st Ohio Volunteers, aged 22 years, was wounded at the battle of Winchester, Virginia, September 19th, 1864, by a conoidal ball, which fractured the frontal bone two inches above the left eye. On the same day he was admitted to the hospital of the 2d division, Army of West Virginia; thence was sent, on September 25th, to the Haddington Hospital at Philadelphia. Simple dressings were applied to the wound. On May 12th, 1865, he was transferred to the Satterlee Hospital, and was discharged the service June 6th, 1865, and received a pension, which was increased in October, 1867. At that time Pension Examiner H. Conkling reported a portion of the bone lost, the wound discharging frequently, and the patient unable to obtain a livelihood owing to frequent attacks of vertigo and nausea, which were aggravated by exposure to the sun. His disability is rated total and permanent.

Case.—Private James W. Woodward, Co. K, 60th Illinois Volunteers, was wounded at Buzzard's Roost, Georgia, February 25th, 1864, by a piece of shell, which fractured the frontal sinus one inch above the nasal eminence. He was admitted to the regimental hospital on the same day, and on February 29th was sent to the hospital at Chattanooga, Tennessee. He recovered, was furloughed on April 6th, 1864, and finally was mustered out of service on March 14th, 1865, and pensioned. Examining Surgeon G. Brattan, in a communication dated April 20th, 1868, states that there was necrosis of the frontal bone, and that the wound had not entirely healed. The disability is rated as total.

Case.—Private Charles Dillman, Co. H, 3d New Jersey Volunteers, was wounded at the battle of Chancellorsville, May 3d, 1863. The missile passed into the brain, near the junction of the parietal and occipital bones. He was admitted to the hospital of the 1st division, Sixth Corps. He was delirious, and would allow no clothing upon him. At times, he would not eat; at others, his appetite was ravenous. He passed his urine involuntarily, but retained his fæces. His memory was totally lost. On examination, no depression about the circumference of opening was discovered. Expectant treatment was used, and on June 1st, the patient was much improved. He ate regularly, slept, and his memory gradually returned; but he misplaced

words and coined new ones. On June 12th, he was sent to Armory Square Hospital, Washington, and on June 22d, to Citizens' Hospital, Philadalphia. The outer table of the cranium became necrosed. He was returned to duty March 9th, 1864. On June 23d, 1864, he was discharged the service and pensioned, his disability being rated one-half; and since, up to September 30th, 1869, he has suffered from occasional attacks of epilepsy.

CASE.—Private Ramsford Dunsmore, 44th New York Volunteers, was wounded at Hanover Court House, May 27th, 1862, by a musket ball, which entered above the right zygoma, carried away part of the external ear, fractured the petrous portion of the temporal bone, and emerged at the base of the occipital bone. He was delirious for one hour after the reception of the injury. Small pieces of bone were discharged from the wound, and the mind was impaired. On August 22d, 1862, he was admitted to the Ladies' Home Hospital, New York, from which he was discharged September 23d, 1862. Afterward there was occasional pain, and the memory was impaired. This patient is not a pensioner.

Exfoliations after Depressed Gunshot Fractures of the Skull.—Instances of the eliminations of considerable portions of the outer table, or of both tables of the cranium, were not infrequent results of necrosis following gunshot fracture. Several illustrations have been already cited,[1] and others will be adduced in connection with the subjects of trephining and the removal of fragments. Hence it will be necessary to refer, in this place, to a few only:

CASE.—Private Dominick Barney, Co. H, 8th Minnesota Volunteers, aged 31 years, was wounded at the battle of Murfreesboro', Tennessee, December 14th, 1864, by a conoidal ball, which caused a penetrating fracture of the petrous and squamous portion of the left temporal bone. For a few days he was treated in a field hospital; thence he was sent to hospital No. 4, Murfreesboro'. The case progressed favorably. On February 16th, 1865, the patient was transferred to Nashville, and thence, in March, to Jefferson Barracks near St. Louis. He was discharged from service on May 21st, 1865. On March 29th, 1866, Pension Examiner J. F. Scholl reported that exfoliation was still going on. The sinus, immediately above the meatus, was constantly discharging matter, as well as the meatus itself. The hearing was completely destroyed on one side. The mind was much impaired. He rated his disability total and temporary.

CASE.—Private Charles E. Patch, Co. C, 14th New Jersey Volunteers, aged 19 years, was wounded at the battle of Cold Harbor, Virginia, June 1st, 1864, by a gunshot missile, which entered the face, between the inferior and superior maxillary bones, and emerged behind the ear, probably traversing the meatus in its course. He was taken prisoner and conveyed to Richmond, where he was admitted to Confederate Hospital No. 21. By July 31st, the temporal bone had become partially exposed, some fragments had escaped, and the sense of hearing was destroyed. With the exception of an occasional pain in the ear, the patient was doing well. He was afterward paroled, and on March 29th, 1865, was admitted to the Ward Hospital, Newark, New Jersey, where he was discharged the service June 29th, 1865, and pensioned. On August 31st, 1865, Pension Examiner J. G. Stearns reported that there was a purulent discharge from the wound. On the 28th, a portion of bone came out, over an inch in length, making, in all that have come out of the jaw and ear in consequence of the wound and gangrene, twelve pieces. There is total loss of external ear, which, with the paralysis, causes great deformity.

CASE.—Private Samuel Binns, Co. C, 88th Pennsylvania Volunteers, aged 17 years, was wounded at Bull Run, August 30th, 1862, by a projectile which entered the frontal bone one inch above the nasal eminence, a little to the right of the median line, and emerged at the external angular process. He was admitted to the Episcopal Hospital, Philadelphia, December 16th, 1862. There was a discharge of pus from the loose tissue of the superior eyelid, and the wound of entrance, from which pieces of bone had been discharged at different times before his admission, was still open. The wound of exit had closed, and the opening, formed for the escape of pus, was filled with a mass of granulation. The sight of the right eye was dim. On December 20th, another piece of bone escaped from the wound of entrance, which afterward closed, and the patient was discharged the service March 11th, 1863, and pensioned. Pension Examiner W. Carson subsequently reports that exfoliation has resulted, with great injury to the right eye and ear. His disability is rated three-fourths and doubtful.

CASE.—Private Alexander McGill, Co. I, 2d New Jersey Volunteers, aged 32 years, was wounded at the battle of Bull Run, Virginia, August 29th, 1862, by a fragment of shell, which fractured and depressed the external table over the coronal suture. He was, on September 1st, conveyed to Washington, a distance of thirty miles, and admitted into the Unitarian Church Hospital. He suffered from paralysis of the right side of the body and retention of urine. Unsuccessful efforts were made to elevate the depressed bone. Cold water dressings were applied. On September 10th, the power of motion in the arm and leg had returned, and on the 20th, the patient was so far recovered that he was able to walk with the help of a cane. He recovered, with the exception of a slight weakness in the right knee, and some difficulty in voiding his urine, which latter trouble was overcome by small doses of sweet spirits of nitre. On October 5th, he was transferred to New York City and admitted into the City Hospital. Through the wound, which was granulating firmly, necrosed bone could be detected. An attempt was made to remove the latter, but failed. The patient was discharged from the service on January 8th, 1863. The case is reported by Surgeon A. Wynkoop, U. S. V. In January, 1863, Dr. H. C. Clark, Assistant Surgeon, 2d New Jersey Volunteers, reported that from a shell wound received on August 27th, 1862, a portion of the skull was carried away, leaving a space an inch in diameter unprotected by any bony structure, and added that the man was unable to maintain himself, and was entitled to full pension. His claim for pension was rejected December 29th, 1865, for want of evidence.

[1] Some of the more interesting specimens of exfoliations from the cranium, contained in the Army Medical Museum, are represented by FIGURES 30, 31, 36, 37, 38, 39, 40, 47, 51, 53, 55, 58, 62, 99, and FIGURES 14 and 20, of the Catalogue of the Surgical Section of the Army Medical Museum.

Case.—Private John H. Booker, Co. L, 1st Maine Heavy Artillery, aged 23 years, was wounded in the engagement at City Point, Virginia, June 18th, 1864. The missile struck the skull at the junction of the coronal and sagittal sutures, lacerating the scalp, and fracturing and depressing the outer table nearly one-half inch each way. At the same time the patient received gunshot wounds of the back and thigh. He was admitted to the hospital of the 3d division, Second Army Corps, and on July 2d was sent to the 3d division hospital at Alexandria, Virginia. The injuries healed kindly until July 18th, when the wound of the thigh became gangrenous, the disease extending over a surface of three inches. Lotions of chloride of zinc and afterward of creosote were applied, and tonics and anodynes given. On August 10th, a piece of exfoliated bone half an inch in diameter was removed from the wound of head, and, on August 25th, two more pieces of the same size were taken away. The slough had separated on August 1st, and the wound had again assumed a healthy appearance, and continued to improve during the months of September and October, when, about the middle of November, the hands and feet became œdematous, the face grew puffy, and finally the abdomen commenced to swell. By the middle of December the girth of the body at the umbilicus was thirty-eight inches. But little urine was passed, yet no symptoms of cerebral disturbance were noticed. The patient died January 9th, 1865. At the autopsy, the cavities of the chest and peritoneum were found much distended with serum, and the kidneys were completely degenerated. The case is reported by Surgeon E. Bentley, U. S. V.

Case.—Private John G. Wilson, Co. F, 24th Ohio Volunteers, was wounded at the battle of Shiloh, Tennessee, April 7th, 1862, by a fragment of shell, which struck the right parietal bone near its posterior superior angle, and carried away a portion of both tables about an inch in dimension. He was discharged December 1st, 1862, and was examined for a pension November 10th, 1863, by Pension Examiner Charles Hay, who reported the dura mater exposed, the pulsations of the brain visible, and the patient obliged to use chloroform to relieve spasms, which occurred periodically. His general health had suffered greatly. There was no new formation of bone. On October 22d, 1867, Pension Examiner R. D. Hammond reported a considerable loss of bone. There was constant discharge of pus from the wound and small pieces of bone were occasionally thrown off. His disability is rated total and permanent by Dr. R. D. Hammond, pension examiner at Macomb, Illinois.

Case.—Private William Fisher, Co. G, 98th Pennsylvania Volunteers, was wounded near Fort Stevens, Washington, July 12th, 1864, and was admitted into Mount Pleasant Hospital on the following day. A little above the right ear was a scalp wound an inch and a half long. Acting Assistant Surgeon P. C. Porter, under whose care the patient came, satisfied himself that a piece of the mastoid process was chipped off, and that a fracture extended into the petrous portion of the temporal. From the aspect of the wound, Dr. Porter was inclined to the belief that it was inflicted by a conoidal musket ball. The patient did well with simple dressings, and rest, and gentle cathartics, till the 20th of July, when the wound began to slough. Applications of charcoal and yeast poultices, nitric acid, and creasote, failed to arrest the sloughing, which presently gave rise to repeated hæmorrhages from branches of the temporal artery. The gangrene continued to spread until August 9th, when the eschars separated, leaving a space five inches in diameter on the right side of the head, denuded of integument, fascia, and muscles. During this long period, the patient complained of no inconvenience at the seat of fracture, though there was at times acute frontal pain. Early in September, it was evident that the exposed portions of the temporal and parietal bones were necrosed, and on September 6th, a fragment of the squamous portion of the temporal was removed. Two days subsequently other fragments were detached and extracted. After this the wound began to cicatrize rapidly, and on December 3d, 1864, the patient was reported to be entirely out of danger, and in fact nearly well. On February 14th, 1865, he was discharged from service on a certificate of disability signed by Surgeon H. Allen, U. S. A. He was pensioned. In 1865, he was reported as partially deaf. He was last paid at the Philadelphia Agency, September 4th, 1870, and his pension had been reduced, from which it may be inferred that the examining surgeon regarded his disabilities as comparatively slight.

Fig. 99.—Exfoliation from the right parietal and temporal, resulting from gunshot injury. *Spec.* 3451, A. M. M.

Case.—Private R. W. Hamlin, Co. F, 4th Michigan Volunteers, aged 22 years, was wounded at Gettysburg, July 2d, 1863, by a conoidal ball which entered anterior to top of right ear, passed backward and downward through the external ear, injured the mastoid process, and emerged at the back of neck six inches from point of entrance. He fell senseless, and was carried to the Seminary hospital, remaining unconscious for two days. On July 20th, he was sent to hospital at York, Pennsylvania. He suffered much pain in side of head, and the principal discharge came from the external meatus, where a piece of bone made its exit. On August 22d, the orifice of entrance was filled with granulations, and that of exit had become covered with plastic lymph. The movement of jaw became, to some extent, limited, and the patient could not close the right eyelid or raise the right eyebrow. On May 31st, 1864, he was admitted to Fairfax Seminary Hospital; on June 7th, was sent to Haddington Hospital, Philadelphia; on June 11th, to Satterlee Hospital; and on August 5th, to St. Mary's Hospital, Detroit, Michigan, where he was discharged from the service September 13th, 1864. He is not a pensioner.

Case.—Corporal James W. Williams, Co. G, 39th United States Colored Troops, aged 26 years, was wounded before Petersburg, Virginia, July 30th, 1864, by a conoidal musket ball, which fractured the frontal bone over the frontal sinus, near the parietal bone. No record of the case can be found until August 18th, when the patient was admitted to the Summit House Hospital, Philadelphia. He was thence transferred as follows: on March 29th, 1865, to the hospital at Beverly, New Jersey; on May 12th, to the Whitehall Hospital, near Bristol, Pennsylvania; on June 26th, to the Satterlee Hospital, Philadelphia; and on July 30th, to the Mower Hospital, where he was discharged from service on September 9th, 1865, and pensioned. Subsequent information states that discharges of bone continued a year after the reception of the injury. The patient suffered from dizziness, faintness, and a sense of insecurity, which unfitted him for any occupation, especially such as required stooping or exertion. His disability is rated one-half and temporary by Examining Surgeon J. R. Rowand.

CASE.—Sergeant John O'Flaherty, Co. D, 24th Wisconsin Volunteers, was wounded by a missile at the battle of Chickamauga, Georgia, September 19th, 1863, which fractured both tables of the frontal bone above the right eminence. He was admitted to the field hospital, 3d division, Twentieth Corps, and on October 21st, was sent to the hospital at Stevenson, Alabama. A day later, the patient was transferred to Hospital No. 13, Nashville. About December 1st, he was sent to Hospital No. 3, at Louisville, and on March 19th, to the hospital at Madison, Indiana. He was discharged from service on April 19th, 1864, and pensioned. An opening, one inch and a half long by one inch wide, caused by exfoliation of bone, had healed and was covered only by the integument. The patient was subject to occasional attacks of vertigo following either mental or physical excitement, and loud voices produced pain in the head. His disability is rated three-fourths and doubtful.

CASE.—Private Charles E. Tremain, Co. H, 45th Pennsylvania Volunteers, aged 29 years, was wounded before Petersburg, April 2d, 1865, by a conoidal musket ball, which struck behind the right ear, fractured the occipital bone and was, afterward, extracted from the neck. In the same engagement, and while in a state of unconsciousness, a ball struck the right foot on its outer edge, near the middle, and, passing inward and upward, emerged at the instep; the second toe of the same foot had been carried away by a rifle ball at the Wilderness, May 6th, 1864. He was treated at the depot field hospital of the Ninth Corps until April 7th, when he was sent to the Slough Hospital at Alexandria. The metatarsal bones became necrosed. He was mustered out July 17th, 1865, and pensioned from that date. On January 17th, 1870, Pension Examiner F. B. Wagner reports that the wound in the head often inflames and suppurates, and that dead pieces of bone exfoliate. The patient was subject to pain in the head, and his memory was greatly impaired. The foot was anchylosed and cold. His disability is rated total and permanent.

Remote Results of Depressed Fractures.—Besides epilepsy and derangements of vision and hearing, and the other disabilities referred to on page 171 and the following pages, a large number of instances were reported in which gunshot depressed fractures of the skull were followed by headache and vertigo, persistent pain at the part struck, various forms of paralysis of motion, and modifications of sensation, and mental derangements. A few such cases may be cited:

CASE.—Private *William H. Cash*, McIntosh's Battalion, Rockbridge Artillery, was wounded at Fredericksburg, December 13th, 1862, by a fragment of shell, which struck the upper portion of the left side of the frontal bone, carrying away a segment of bone an inch square, and exposing the brain. He was admitted to hospital No. 1, at Richmond, on January 26th, and, on March 13th, 1865, he was retired from the service. The cicatrix was at that time large, and the pulsations of the brain were plainly visible. Paralysis agitans, in an incipient form, existed at the date at which the patient was retired. The ulterior history of the case is unknown. The abstract is from the records of the Confederate Surgeon General's Office.

CASE.—Private Isaac P. Baldwin, Co. I, 41st Ohio Volunteers, aged 24 years, was wounded at the battle of Shiloh, Tennessee, April 7th, 1862, by a missile which passed through the right malar and temporal bones. The case progressed finely. He was treated at City Hospital, St. Louis, and at Camp Dennison, Ohio. At the latter, on August 14th, 1862, he was discharged the service. He re-enlisted July 18th, 1863, and on January 18th, 1865, was again discharged, and was pensioned. In May, 1865, there was partial paralysis of the left side of face, and deafness of the right ear, and his disability was rated one-half and permanent.

CASE.—Private Samuel Lyon, Co. E, 54th New York Volunteers, aged 25 years, was admitted, on January 14th, 1863, to Mower Hospital, Philadelphia, with a gunshot fracture of the left parietal bone. The wound healed readily, and on March 27th, 1863, he was discharged the service, being still troubled with neuralgic pains in the frontal region. He is not a pensioner.

CASE.—Private Robert McAllister, Co. G, 57th New York Volunteers, aged 42 years, was struck by a bullet at Fredericksburg, December 13th, 1862, which caused a lacerated wound of the scalp, and fractured a portion of the left parietal bone. He was admitted to the field hospital of the 1st division, Second Corps, on the same day, and a few days later was transferred to Washington, and on the 17th was admitted to the Campbell Hospital. On February 3d, 1863, he was discharged the service and pensioned, his disability being rated total and permanent. The case is reported by Surgeon J. H. Baxter, U. S. V. A subsequent report states the patient's right arm to be paralyzed and atrophied.

CASE.—Private Henry Rice, Co. B, 29th Pennsylvania Volunteers, aged 27 years, was wounded at the battle of Altoona, Georgia, June 15th, 1864, by a conoidal musket ball which fractured the cranium. He was admitted to the hospital of the 2d division, Twentieth Corps, and on the 22d, was sent to the general hospital at Chattanooga, Tennessee. On July 7th, he was transferred to Nashville and admitted into hospital No. 19, but, three days afterward, was sent to Jefferson Hospital in Indiana. In September he was furloughed, and on the 1st of December, transferred to the hospital at Madison. Partial paralysis of the body had ensued, and the patient was discharged the service December 2d, 1864. In September, 1867, he was a pensioner, his disability being rated total and permanent by Dr. J. Cummiskey, the pension examiner. At that date paralysis was limited to the right foot.

CASE.—Private *A. Perkerson*, Co. A, 13th Virginia Cavalry, was wounded at the battle of Gettysburg, July, 1863, by a piece of shell which struck the skull at the vertex. His history is unknown until March 3d, 1864, when he was admitted to an hospital at Richmond. He had been troubled with incontinence of urine ever since the reception of the injury. The wound had entirely healed, with slight loss of bone, showing a small furrow. The patient complained of severe pain in the lumbar region, and his speech indicated partial paralysis of the tongue. He stated that his right side had been partially paralyzed, and he still suffered occasionally from numbness of the right hand and foot. Oil of turpentine was ordered as a counter-irritant to the back, but up to May 23d, 1864, there had been no material change in the condition of the patient.

CASE.—Private Augustus J. Butler, Co. A, 7th Maine Volunteers, aged 19 years, was wounded at the battle of Cold Harbor, Virginia, June 6th, 1864, by a conoidal musket ball, which fractured the parietal bone at the eminence. He was conveyed by steamer to Alexandria, and admitted, on the 14th, into the 3d division hospital. Paralysis of the lower extremities existed. Simple dressings only were applied. The patient recovered partial control of the muscles of the leg, and was discharged from service January 10th, 1865. Not a pensioner.

CASE.—Private John Shoemaker, Co. H, 100th Illinois Volunteers, aged 19 years, was wounded near Hillsboro', Tennessee, August 1st, 1863, by a musket ball, which entered the vertical portion of the frontal and escaped at the centre of the right parietal bone, grooving both tables. For two weeks he was treated in the field hospital. On the 18th, he was sent to the Cumberland Hospital at Nashville. On the 26th of September, he was transferred to Louisville, Kentucky; thence, on the 2d of December, to the hospital at Quincy, Illinois. Partial paralysis of the left upper and lower extremities had ensued by this time, but the wound was gradually healing, and his appetite was good. By the use of strychnia, some improvement in the motion of the leg was obtained. He was discharged from service April 2d, 1864, still experiencing considerable difficulty in walking. Acting Assistant Surgeon D. C. Owen reports the case. Not a pensioner.

CASE.—Private Frederick Abel, Troop B, 5th New York Cavalry, aged 52 years, was wounded at the battle of White Oak Swamp, Virginia, June 15th, 1864, by a conoidal musket ball, which fractured and passed through the most prominent portion of the occipital bone. He fell to the ground insensible, and remained so for twenty-four hours. He was then conveyed to the Chesapeake Hospital at Hampton. Paralysis agitans supervened immediately on return of consciousness. By the 4th of July, he was able to bear transportation to the Sixteenth and Filbert Streets hospital in Philadelphia. On March 25th, 1865, he was transferred to the Turner's Lane hospital; thence, on May 10th, to the McClellan Hospital, where he was discharged on July 1st, 1865. In January, 1868, he was in receipt of a pension, his disability being rated one-half and permanent.

CASE.—Private Christopher C. Colson, Co. A, 37th Massachusetts Volunteers, aged 24 years, was wounded at the battle of the Wilderness, Virginia, May 6th, 1864, by a conoidal musket ball, which fractured the left parietal bone. He was admitted to the hospital of the 2d division, Sixth Corps; and thence, on the 25th, he was sent to the Armory Square Hospital at Washington. The case progressed well under ordinary treatment. On June 16th he was transferred to the Knight Hospital, New Haven, Connecticut; on October 16th to Readville, Massachusetts; and on March 22d, 1865, he was returned to duty from the Dale Hospital, Worcester, Massachusetts. Persistent hemicrania of the left side, however, rendered him unfit for duty, and, on May 23d, 1865, he entered the Lincoln Hospital, at Washington, and was mustered out of service June 12th, 1865.

CASE.—Private Jason Cowles, Co. E, 179th New York Volunteers, aged 43 years, was wounded before Petersburg, Virginia, April 2d, 1865, by a conoidal musket ball, which fractured the superior portion of the left parietal bone. He was admitted to the hospital of the 2d division, Ninth Corps, on April 3d; was transferred to the hospital at Fort Monroe, and on June 29th, sent to the Ira Harris Hospital, Albany, New York, where he was discharged from service on July 24th, 1865. On September 9th, 1867, Pension Examiner L. H. Allen reported a deep depression from loss of bone, which caused great physical and mental impairment. His disability was rated three-fourths and of uncertain duration.

CASE.—Private Charles H. Rhodes, Co. F, 3d Vermont Volunteers, aged 24 years, received a gunshot fracture of the skull at the battle of Fredericksburg, December 13th, 1862. He was admitted to the regimental hospital. On December 17th he was sent to St. Aloysius Hospital, Washington; on January 7th, 1863, was transferred to Governor Smith Hospital, Brattleboro', Vermont, and was discharged the service January 31st, 1863, and pensioned, his disability being rated total.

CASE.—Private John E. Edmonds, Battery E, 2d New York Heavy Artillery, aged 22 years, was wounded at the battle of Petersburg, Virginia, June 18th, 1864, by a conoidal ball, which fractured the right parietal bone. He was admitted on the same day, to the 1st division, Second Corps, hospital, and was transferred to the Carver Hospital, Washington, on June 22d. The functions of the brain were found to be, in a measure, impaired. He remained in the Carver Hospital until October 25th, when he was transferred to the Ricord Hospital. Being regarded unfit for the Veteran Reserve Corps, he was discharged from service on March 22d, 1865, and pensioned. Pension Examiner Alonzo Churchill reports that the patient suffered pain in the head with dizziness, which was increased by exercise, and rates his disability more or less permanent.

CASE.—Private George W. Gibson, Co. K, 1st Wisconsin Volunteers, aged 34 years, was wounded at the battle of Dallas, Georgia, May 31st, 1864, by a piece of shell, which fractured the right parietal bone, and lodged at the seat of fracture. He was sent to the hospital of the 1st division, Fourteenth Corps, and on June 15th, was conveyed to Chattanooga; thence was sent, on the 28th of June, to hospital No. 3, at Nashville. The missile was extracted two months and five days after the injury. On the 30th of August, the patient was transferred to the Harvey Hospital at Madison, Wisconsin. There was hemiplegia of the left side which existed up to October 14th, 1864, the date of his discharge and pension. On February 15th, 1868, Pension Examiner J. S. Hurd reports the hemiplegia still continuing; the patient subject to epilepsy on slight exertion, and unable to remain in the open air during warm weather without pain in the head. His disability is rated total and permanent.

PENETRATING GUNSHOT FRACTURES OF THE SKULL.—Though the larger number of such accidents are immediately fatal, the sufferers being instantly killed, or lingering for a few hours at the field depots; yet a not inconsiderable number of cases came under treatment at the hospitals. The following are among the more remarkable examples of survival after penetrating gunshot fractures of the skull:

CASE.—Private Thomas W. Dillon, Co. E, 3d New Jersey Volunteers, aged 27 years, was wounded at the battle of Chancellorsville, May 3d, 1863, by a musket ball. The patient remained within the enemy's lines some days after receiving the injury, and was subsequently brought to the hospital of the Sixth Corps at Potomac Creek. Upon examination, it was found

that the missile had entered the cranium very near the superior angle of the occipital bone, and had passed anteriorly into the substance of the brain. There was no comminution, fissuring, or depression of bone about the wound of entrance, nor hernia cerebri. The wound had not been dressed, probably because of the natural supposition that the case would prove speedily fatal. After shaving the head and removing a few small fragments of bone, the wound was dressed with cold water, and the patient was placed upon mattresses on the floor of the tent, it being impossible to retain him upon a bed without force. Here he remained for a week, in a contorted position, with pupils dilated, respiration slow, and pulse 50, and passing his evacuations involuntarily. He slept most of the time and only aroused when spoken to loudly. The patient received little attention, the case being regarded as hopeless; but at the end of ten days he began to retain his evacuations and obey the calls of nature, sleeping generally at night and sitting up during a part of the day. At no time was he conscious of pain, except from light. By the first week of June, the patient's strength was almost entirely restored; the wound had closed, and all his functions, except memory, were normal. He remembered nothing since his admission to hospital, and did not recognize intimate relations. On June 13th, 1863, the patient was transferred to Philadelphia, at which time he was able to walk to the station, a distance of nearly half a mile. In April, 1864, he was returned to his regiment in the field, perfectly well physically, but with an intellect somewhat impaired. He remembered all that had occurred previous to the reception of the injury; but from that time till an indefinite period in the autumn, he was totally unconscious. He is not a pensioner. The case is reported by Surgeon Lewis W. Oakley, 2d New Jersey Volunteers.

Case.—Private Francis Reynolds, Co. F, 3th United States Infantry, aged 27 years, was admitted, on June 18th, 1863, to Satterlee Hospital, Philadelphia, with a gunshot fracture of the right parietal bone. A conoidal musket ball had entered the right side of the forehead, and had passed upward and backward. On admission the wound had healed, giving no sign of inflammation or suppuration. The patient was frequently troubled with a sharp pain on the top of the head, a little to the right side, which sometimes caused dizziness. He recovered, and was returned to duty on September 21st, 1863. This man is not a pensioner.

Case.—Corporal Andrew Rupp, Co. C, 82d Illinois Volunteers, aged 29 years, was wounded in an engagement at Dallas, Georgia, May 25th, 1864, by a round musket ball which impacted itself in the left temporal bone. He was admitted to the hospital of the Twentieth Corps; on June 1st, sent to the field hospital at Chattanooga; and on June 9th, to the Sherman Hospital at Nashville, whence he was furloughed on July 16th. At the expiration of his leave, August 15th, 1864, he was admitted to the Desmarres Hospital, at Chicago, Illinois. The wound had not healed; cold water dressings were applied. On December 23d, the greater portion of the ball was removed. Slight discharge followed the operation and continued for some weeks, after which the wound readily cicatrized. He was discharged from service on May 23d, 1865, and pensioned. At that time he experienced but little, if any, inconvenience from the remaining portion of the impacted ball, which it was found impracticable to remove. Pension Examiner J. P. Lynn, August 10th, 1867, reports thickening, filling up, and complete deafness of patient's left ear, and rates his disability one-third and permanent.

Case.—Private John Daly, Co. C, 106th New York Volunteers, aged 22 years, was wounded near Petersburg, Virginia, April 2d, 1865, by a conoidal ball, which penetrated the frontal bone a little to the left of the median line. He was, on the following day, admitted to the depot field hospital of the Sixth Corps, and on April 7th, was transferred to the Stanton Hospital, Washington. Simple dressings only were applied to the wound. The case progressed favorably, and on June 5th, 1865, Daly was discharged from service, and was pensioned. On March 29th, 1865, Pension Examiner George S. Gale reported that this man appears odd, but quite shrewd. He could then discover no signs of paralysis, but the patient complained of dizziness when stooping. His disability is rated total.

Case.—Private Samuel P. Ingram, Co. G, 48th Illinois Volunteers, was wounded at Dallas, Georgia, August 14th, 1864, by a conoidal ball, which entered at the outer edge of the left superciliary ridge of frontal bone, passed backward and downward, involving in its course the lower surface of anterior left lobe of cerebrum. He was on the same day admitted to the hospital of the Fifteenth Corps, whence he was furloughed on August 24th. On January 15th, 1865, he was admitted to the hospital at Evansville, Indiana, and was discharged from service on January 27th, 1865, and pensioned. On June 21st, 1866, Pension Examiner J. J. Lesher, reported that there is a small depression from loss of bone at the wound of entrance. The patient's mind is slightly affected, and he is guilty of irregularities both mental and moral. He rates his disability at one-fourth and permanent.

Case.—Private Solomon Farr, Co. F, 17th Maine Volunteers, was wounded at Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal ball, which penetrated the cranium. When admitted to the hospital of the 1st division, Third Corps, he was speechless. On July 16th, he was sent to McKim's Mansion Hospital at Baltimore. On September 30th was transferred to Patterson Park Hospital of the same city, whence he was returned to duty October 4th, 1863. On May 6th, 1864, he was killed in action at the battle of the Wilderness.

Case.—Captain Thomas Church, Co. E, 53d Pennsylvania Volunteers, received at the battle of Fair Oaks, Virginia, June 1st, 1862, a gunshot wound of the head with injury of the left parietal bone. He was conveyed to Philadelphia, and on the 4th admitted into the St. Joseph Hospital, whence, a few days later, he went home on leave of absence. On February 23d, 1863, being unfit for duty, he was discharged the service, and pensioned on May 9th, 1863. Pension Examiner S. R. Wagenseller, reported that there were several sinuses passing into the skull, communicating with the membranes of the brain. From these sinuses there was a constant discharge of pus, which produced headache, vertigo, etc., when retained. He was unfit for either physical or mental exertion, and his disability was rated total and doubtful. A communication from the patient, dated January 17th, 1870, says that his wound has never healed, but remains open and discharges.

Case.—Private Andrew J. McMahon, Co. D, 27th Michigan Volunteers, aged 19 years, was wounded near Petersburg, July 30th, 1864, by a fragment of shell, which fractured the right superior border of the frontal bone near its articulation with the parietal. On the same day he was admitted to the hospital of the 3d division, Ninth Corps, and, on August 1st, was sent to

City Point; thence he was conveyed by hospital steamer to Lowell Hospital, at Portsmouth Grove, Rhode Island, where he was admitted August 7th, 1864. In November he was transferred to Harper's Hospital, Michigan, and was discharged the service December 29th, 1864, and pensioned. On January 27th, 1868, Pension Examiner W. F. Breakey reported both tables of the bone lost from necrosis, and only a membranous formation covering the opening. There was protracted suppurative discharge, acute susceptibility to heat, vertigo, loss of memory, melancholia, symptoms of compression and general mental impairment, all of which were aggravated by labor or excitement. Sometimes, after stooping, he would fall and become unconscious. His disability was rated total, and of the third grade.

Case.—Private Richard Markham, Troop C, 4th U. S. Cavalry, was admitted on April 8th, 1863, to Hospital No. 8 at Louisville, Kentucky, with a fracture of the right temporal bone, produced by a piece of shell. The patient was discharged November 28th, 1863, and pensioned. The wound was reported healed; but it occasionally discharged pus and pieces of bone. He suffered from headache and dizziness, and his general health was impaired; his disability being rated total and permanent.

Case.—Private Warren Mitchell, Troop D, 1st Wisconsin Cavalry, aged 21 years, was wounded in an engagement near Jefferson City, Missouri, October 7th, 1864, by a conoidal musket ball, which fractured both tables of the parietal bone. On the 12th he was sent to the general hospital at Jefferson City, where simple dressings were applied. During the treatment several spiculæ of bone were removed from the wound. Complete paralysis of the right side and parietal paralysis of the left ensued. The patient was discharged the service July 10th, 1865, and pensioned, his disability being rated total and permanent. A communication from Pension Examiner N. Udell, states that the patient suffers from general paralysis; that he has been confined to his bed for twenty months, and is helpless.

Case.—Private Michael Murray, Troop F, 3d New York Cavalry, aged 29 years, was wounded while a prisoner at Richmond, in October, 1864, by a buckshot, which fractured the left side of the cranium. He was paroled, and on March 11th, 1865, was admitted to the 1st division hospital at Annapolis; subsequently he was sent on March 22d to the Jarvis Hospital at Baltimore; on the 12th of April to the Ladies' Home Hospital, New York City; and on May 24th to the McDougall Hospital, Fort Schuyler, New York Harbor, where he was discharged the service June 23d, 1865, and afterward pensioned. On August 20th, 1868, Pension Examiner G. S. Gale reports the process of exfoliation still in progress, and the left part of the whole body in a semi-paralytic state; the arm useless, and the patient rendered quite helpless from frequent convulsions. His disability is rated total and permanent.

Case.—Sergeant William L. Henderson, Co. A, 123d Illinois Volunteers, aged 27 years, was wounded in an engagement at Selma, Alabama, April 2d, 1865, by a buckshot, which entered one-half an inch above and anterior to the meatus auditorius externus, fractured the left temporal bone, and emerged one inch from the point of entrance. He was treated in a field hospital until May 8th, when he was conveyed to the hospital steamer D. A. January. On May 25th, he entered the hospital at Mound City, Illinois, and on May 31st, 1865, he was discharged the service. The wound had entirely healed. On February 7th, 1870, Pension Examiner A. Fergusson reported that the ball remains imbedded in the bone. The patient suffered from vertigo, with loss of memory, and was unable to labor. He was a farmer by occupation; his general health was good, and his habits were regular. His disability is rated at three-fourths and permanent.

Case.—Private Gustave Stork, Battery B, 15th New York Artillery, aged 25 years. Conoidal ball entered just anterior to the external meatus of left ear and lodged, probably in petrous portion of temporal bone. Bull Run, Virginia, August 29th, 1862. No treatment until May 11th, 1864, when he was admitted to Columbian Hospital, Washington. He was transferred as follows: May 15th, 1864, to Patterson Park, Baltimore; August 17th, to Camden Street, Baltimore, and on September 12th, 1864, to Mower Hospital, Philadelphia, where an ineffectual attempt to remove the ball was made. Discharged from service June 16th, 1865. Not a pensioner.

Case.—Private George Potter, Battery C, 3d Massachusetts Heavy Artillery, aged 26 years, received, at the battle of Mechanicsville, June 11th, 1864, a penetrating fracture of the cranium by a conoidal musket ball, which entered the cavity through the parietal bone. He was sent to the hospital of the 1st division, Fifth Corps, and on June 13th, was transferred to the Finley Hospital at Washington. The case progressed satisfactorily under simple treatment, and on June 23d, the patient was furloughed. On the 22d of August, he was transferred to the Mason Hospital at Boston. Paralysis of the left side had ensued, and still existed at the time of his discharge, September 10th, 1864. He is not a pensioner.

Case.—Private Charles J. Williams, Co. E, 15th Ohio Volunteers, aged 19 years, was wounded at the battle of Shiloh, April 7th, 1862, by a missile, which penetrated the right parietal bone at its posterior superior angle. On April 11th, he was taken on board the steamer D. A. January, and was conveyed to the City Hospital, St. Louis, where he was admitted on April 14th. He was afterwards furloughed, then admitted to Camp Chase, Ohio, and on July 18th, 1862, was discharged the service. In March, 1866, Pension Examiner John C. Hupp reports a circular opening in the patient's skull of about one inch in diameter and half an inch in depth. The sides of the opening were well covered with integument, the bottom partially so. He was also subject to vertigo upon slight exertion. His disability is rated three-fourths and permanent.

Case.—Private George W. Hulse, Co. G, 36th Illinois Volunteers, aged 21 years, was wounded at the battle of Chickamauga, Georgia, September 20th, 1863, by a buckshot which penetrated the occipital bone near the upper margin, and lodged in the brain. In the same engagement, he was wounded in the chest by a conoidal ball which entered between the seventh and eighth ribs. No attempt seems to have been made to extract either missile. On the 6th of October, he was conveyed to Stevenson, Alabama, for treatment, and one month later, he was sent to the Cumberland Hospital, Nashville, Tennessee. On December 2d, he was transferred to the hospital at Quincy, Illinois. During this time, simple dressings only had been applied to the wounds. By the 1st of March, 1864, the wounds had healed; but the patient was anæmic, and suffered more or less pain in the head. On the 11th of the month, he was transferred to the Benton Barracks Hospital, St. Louis, Missouri, and on the

31st, to the Lawson Hospital. The external table was slightly necrosed. He was discharged from service July 5th, 1864, and pensioned. The case is reported by Acting Assistant Surgeon J. F. Wilson. Information received from Pension Examiner A. F. Hand, on April 12th, 1867, states, that the patient suffers from debility, derangement of the urinary organs, and mental imbecility.

CASE.—Corporal George H. Farnum, Co. C, 16th Maine Volunteers, aged 19 years, was wounded at Gettysburg, July 1st, 1863, by a round ball, which penetrated the cranium. He was sent to the Seminary Hospital, remaining there until the 19th of the month, when he was sent to the hospital at York, Pennsylvania. The treatment, so far as recorded, was simple. He recovered and was transferred on the 11th of February, 1864, to the First Battalion of the Veteran Reserve Corps. He is not a pensioner.

CASE.—Private James Lavery, Co. E, 136th New York Volunteers; Gettysburg, July 3d, 1863; gunshot penetrating wound of the left side of head; admitted to a field hospital; July 9th, sent to Satterlee Hospital, Philadelphia; May 13th, 1864, transferred to Veteran Reserve Corps. His disability is rated three-fourths and permanent. There is a traumatic cataract, and the functions of the right eye and right ear are impaired.

Balls lodged within the Cranial Cavity.—Many instances were reported of patients who had survived the lodgement of missiles within the skull; but few or none resembling the cases reported by Larrey, of balls encysted in the brain and giving no inconvenience for years. It is, indeed, reported that some patients went to duty with balls lodged in the cerebrum; but the diagnostic details accompanying the histories of these cases are not sufficiently precise to invite the fullest confidence. In most of the cases, in which the evidence that the ball remained within the skull was conclusive, either fistulous sinuses existed, or there was much cerebral disorder, or the position of the missile was discovered after the patient's death at a period remote from the injury:

CASE.—Lieutenant Herman W. Lilycrantz, Co. D, 103d United States Colored Troops, was wounded at Fort Pulaski, December 24th, 1865, by the accidental discharge of a pistol, at a distance of about four feet from his head. The ball perforated the os frontis over the right superciliary ridge. When first seen, fifteen minutes after the accident, he was vomiting freely, and about a fluid ounce of brain matter had exuded from the wound. The vomiting being checked, but little blood, and no more brain matter, was discharged. A probe, five inches long, glided easily, by its own weight, its full length directly backward through the wound, without coming in contact with the ball. The pulse was 120, and weak; blood was freely discharged from the nose, mouth, and ears; there was considerable extravasation in the cellular tissue of the eyelids and the pupils were dilated. For ten days after the accident the patient showed a tendency to sleep, but was easily aroused and would converse freely, constantly wandering, however, from the topic of conversation. He could neither taste nor smell, and his hearing and sight were much impaired, bright lights causing much uneasiness. He had very little pain, but was restless and had a constant tendency to take hold of the head of the bed and draw himself toward it. Cold applications were made to the head, morphia was administered and low diet ordered. The pulse gradually declined until December 31st, when it was sixty and eighty. Until January 20th, there was no change in the symptoms or treatment; after that, full diet was allowed. On January 24th, he began to take exercise in the open air, and on the 31st, all treatment was discontinued. During the month of February, he had a large axillary abscess. On March 10th, he went northward on furlough, complaining only of muscular weakness and inability to look at a bright light. Occasionally pus would ooze from the wound, which was covered by a scab. He was discharged the service May 11th, 1866. In November, 1867, he was examined by Dr. H. J. Bigelow, who found a small scar and a depression over the frontal sinus, the cause, no doubt, of the epilepsy which attacked the patient every two weeks. These attacks were preceded by a distinct aura and by numbness in the left hand. They became less frequent, and otherwise he was doing well. The name of this patient is not upon the pension list. The case is reported by Assistant Surgeon H. S. Schell, U. S. A. The regimental surgeon, Dr. Warren M. Babbitt, 103d Colored Troops, of Randolph, Massachusetts, printed a report[1] of this case, in November, 1867. He records the patient's name as Libjencrantz; but in the official roster it is recorded as above.[2] In the spring of 1870, Lieutenant Lilycrantz called at the Surgeon General's Office, and was examined by Assistant Surgeon G. A. Otis, U. S. A. There was a small depressed cicatrix above the inner portion of the right eye-brow. The officer's replies to questions indicated a dull intellect. He articulated distinctly and there was no paralysis. He was, at this time, seeking an office in one of the executive departments, and probably obtained one, as a notice of his death, in January, 1871, about five years after the reception of the injury, was observed in one of the Washington newspapers.

CASE.—Private Benjamin B. Claiborne, Troop H, 2d Arkansas Cavalry, aged 23 years, was wounded in an engagement at Osage, Kansas, October 25th, 1864, by a missile which penetrated the frontal bone and lodged. He was immediately conveyed to Fort Scott. The ball was not extracted, but the wound was dressed in the usual manner. The case progressed favorably and Claiborne was returned to duty on December 22d, 1864. Surgeon A. C. Van Duyn, U. S. V., reports the case. A subsequent report by Pension Examiner E. Bennett, October 8th, 1869, represents the patient as totally disabled, being easily overcome by fatigue or heat, and compelled to assume a recumbent posture in frequently recurring attacks of vertigo.

CASE.—Private William Sheridan, Battery I, 5th Ohio Battery, aged 21 years, was, on May 27th, 1865, admitted to hospital at Little Rock, Arkansas, with a gunshot wound through the left temporal region. The missile lodged in the brain. He recovered and was discharged on June 20th, 1865. He is not a pensioner.

[1] *Boston Medical and Surgical Journal*, Vol. LXXVII, p. 346. [2] *Official Army Register of the Volunteer Force*, Part VIII, p. 284. Washington, 1867.

Case.—Private John H. Sechler, Co. H, 21st Wisconsin Volunteers, aged 21 years, was wounded in the engagement at Bentonville, North Carolina, March 19th, 1865, by a conoidal ball, which struck the *os frontis* over the right eye and passed into the brain. He was admitted to the hospital of the 1st division, Fourteenth Corps; on April 5th, sent to the Foster Hospital at New Berne, North Carolina; on April 12th to the Grant Hospital, New York Harbor, and on May 29th, to the Swift Hospital at Prairie du Chien, Wisconsin, whence he was returned to his regiment on August 3d, 1865, for muster out. He is not a pensioner.

Case.—Private John Wolstenholm, Co. B, 37th Indiana Volunteers, aged 25 years, was wounded at the battle of Lost Mountain, Georgia, June 17th, 1864, by a conoidal musket ball, which entered the mastoid process of the temporal bone and penetrated the brain. On the same day, he was admitted to the hospital of the 1st division, Fourteenth Corps; on June 26th, was sent to hospital No. 1, Nashville, thence was transferred, on June 29th, to the Totten Hospital at Louisville; and on July 12th, was admitted to the Soldiers' Home Hospital at Indianapolis. He recovered, and was discharged the service July 24th, 1865. Pension Examiner J. S. McNeily since reports the patient entirely deaf in right ear, the right eye irritable and injected, with constant pain in the right side of the head, impairment of the mental faculties, tendency to vertigo upon slight exertion; and rates his disability total, and permanent. He believed that the missile had not yet been removed.

Case.—Private *William McCann*, Co. C, 1st Maryland Regiment, received a penetrating gunshot wound of the head, and was admitted to hospital No. 1, Richmond, Virginia. The missile was not extracted. He was discharged from the service January 27th, 1864, on recommendation of Surgeon C. B. Gibson, P. A. C. S.

Case.—Private William A. Andrews, Co. D, 25th Massachusetts Volunteers, was wounded at the battle of New Berne, North Carolina, March 14th, 1862, by a buckshot, which entered the right ear, back of the meatus, penetrated the bone, and lodged within the cranium. On March 18th, he was admitted to the Academy Hospital, New Berne; was furloughed on April 20th, and was discharged the service October 16th, 1862, and pensioned. On December 12th, 1862, Pension Examiner Oramel Martin reports the wound still discharging, and the patient complaining of stiffness in the cords of the neck, with weakness of the right arm, he being unable to move it for five weeks, except with the assistance of the left hand. He was still weak, but gradually gaining strength. At times he was subject to slight deafness. In a subsequent report, dated October 19th, 1866, he says that the missile still remained in the brain, that the wound was discharging pus, and that a sinus was opening back of the ear; that his general health was impaired; and that his disability is rated one-half and permanent.

Case.—Private William F. Worley, Troop K, 9th Indiana Cavalry, aged 20 years, was wounded at Franklin, Tennessee, December 23d, 1864, by a conoidal ball, which entered the right external ear, passed downward and backward, and lodged, fracturing the occipital bone. He was taken to the post hospital at Columbia, and on January 19th was sent to hospital No. 2 at Nashville. On July 20th, the patient was transferred to Crittenden Hospital, Louisville, thence to Jefferson Hospital, Indiana, and on July 26th to Indianapolis, where he was mustered out of service August 26th, 1865, and pensioned, his disability being rated one-half and probably permanent. At the date of the patient's discharge, it was reported by Pension Examiner M. H. Harding that he suffered pain and vertigo after any active exercise. Accompanying this information was the sworn deposition of the patient stating the fact that frequent probings had failed to reach the ball, that small pieces of bone were discharged at the time of the probing, and that the wound was a running sore, at times painful.

Case.—Corporal Edward Steible, Co. G, 43d Illinois Volunteers, was wounded at the battle of Shiloh, April 7th, 1862, by a musket ball, which entered the frontal bone one inch above the superciliary ridge, and one inch and a half from the median line, passed through the skull backward and downward, and lodged. The patient was taken on board the steamer Empress on April 20th, was sent to the hospital at Keokuk, Iowa, and on July 17th to the New House of Refuge Hospital, St. Louis, where he was discharged June 3d, 1863. The seat of the ball, which still remained in the head, could not be ascertained, and the wound was still suppurating. A probe, introduced into the fistulous wound, passed through the cribriform plate of the ethmoid, and appeared in the nasal cavity. The man was continually subject to vertigo. He was pensioned, his disability being rated total and permanent.

Case.—Private William Cromwell, Co. G, 7th Ohio Volunteers, was admitted, on December 17th, 1862, to the Continental Hospital, Baltimore, with a penetrating wound of the cranium caused by a buckshot, which entered at the junction of the parietal with the occipital bone. On May 1st, 1863, he was transferred to Fort Wood, New York Harbor, and was discharged the service May 28th, 1863, and pensioned. A report from Pension Examiner O. Pomeroy says that the shot still remains within the cranium, and that the patient suffers from constant headache and frequent attacks of epilepsy rendering him unable to obtain a livelihood; and rates his disability total and permanent.

Case.—Private August McClellan, Co. C, 28th Massachusetts Volunteers, was wounded at the battle of Fredericksburg, December 13th, 1862, by a missile which penetrated the frontal bone, over the left superciliary ridge, and remained within the cranium. He was admitted to the hospital of the 1st division, Ninth Corps; on December 16th, was sent to the hospital at Point Lookout, Maryland; on May 1st, 1863, to West's Building Hospital, Baltimore, and on May 9th, to Portsmouth Grove, Rhode Island, where he was transferred to the Veteran Reserve Corps. He was discharged August 31st, 1866, and pensioned. The patient suffered from vertigo upon exertion. His disability was rated total.

Case.—Corporal *John W. Cook*, Co. D, 52d Virginia Regiment, aged 22 years, was wounded at the battle of Winchester, September 19th, 1864, by a conoidal ball, which fractured the occipital bone and entered the brain. He was treated at Winchester until the 18th of December, when he was sent to West's Building Hospital at Baltimore. The treatment throughout was of a very simple character. The patient recovered, and was transferred on January 5th, 1865, to Fort McHenry for exchange. On March 24th, 1865, he was examined by a Confederate retiring board. The missile was a source of constant irritation to the brain, and the board declared that the patient was unable to perform field duty, but might be employed at some post where the duties were not laborious.

CASE.—Private Jonathan Wiser, Co. E, 49th Pennsylvania Volunteers, aged 35 years, was wounded at the battle of the Wilderness, May 5th, 1864, by a conoidal musket ball, which fractured and slightly depressed the cranium. He was at first admitted to the hospital of the 1st division, Sixth Corps, and, on May 12th, was sent to the Mount Pleasant Hospital, Washington. The records of the latter hospital state that the ball had not been extracted. On September 24th, he was admitted to the Frederick Hospital, Maryland, where he remained under treatment until June 6th, 1865, when he was discharged from service. The case is reported by Assistant Surgeon C. A. McCall, U. S. A. This patient is not on the pension list.

CASE.—Private John F. Leland, Troop F, 1st Illinois Cavalry, was wounded by a gunshot missile, probably a buckshot, which entered the mastoid process of the left temporal bone close behind the middle of the pinna, passed slightly forward and lodged in the cranium, but its exact locality could not be ascertained. The pinna had become adherent to the scalp at the entrance of the wound. The patient suffered pain in the region between the entrance of the wound and the eyebrow. Active exercise, or stooping, would produce dizziness and pain. The vision and hearing of the left side were slightly impaired. He was discharged the service March 14th, 1862, and pensioned, his disability being rated one-half and temporary.

CASE.—Corporal William G. Davis, Co. A, 105th Ohio Volunteers, aged 30 years, was wounded at the battle of Chickamauga, Georgia, September 20th, 1863, by a conoidal musket ball, which fractured and penetrated the right temporal bone, and lodged within the cranium. On September 29th, he was admitted to the hospital at Chattanooga, Tennessee, thence was transferred on October 6th to Stevenson, Alabama, and on October 12th to Nashville, where he remained under treatment until June 18th, 1864, when he was sent to the Totten Hospital, Louisville, Kentucky. On July 15th, he was sent to the hospital at Cleveland, Ohio, and mustered out of service May 31st, 1865, and pensioned. Since the patient's discharge he has suffered from headache and vertigo, and impaired functions of right eye and ear. His disability is rated total and permanent.

CASE.—Private William Sheridan, Battery M, 1st Missouri Artillery, aged 34 years, was wounded at the siege of Vicksburg, May 19th, 1863, by a canister shot. The missile entered the left parietal bone, immediately posterior to the coronal, and three inches from the sagittal suture, passed horizontally inward, a distance of two and a half inches (as stated by the Surgeon who probed the wound at the time of receipt of injury), and lodged. He was taken on board an hospital boat, where an unsuccessful attempt was made to extract the ball. On May 25th, the patient was admitted to the Van Buren Hospital, where he remained some weeks, going about the hospital, dressing his own wound, and suffering but little inconvenience. He was returned to his battery, and on September 3d, 1863, was discharged from service. At that time, and for weeks previous to his discharge, the wound suppurated freely, and occasionally bled, and small fragments of bone escaped. In November, he was placed to work on the levee by the Commissary Department. The work was heavy, but he experienced no trouble, except on approach of a storm, when he had a dull pain and sensation of weight. He was, however, attacked with fever, and on December 14th, was admitted to hospital No. 12, Nashville, and on December 28th, sent to hospital No. 1, of the same place. On January 3d, 1864, the patient was convalescent. The cicatrix is hard and bony, and about on a level with the inner table. The edges of the opening through the outer table are quite abrupt. He was returned to duty on February 24th, 1864. He is not a pensioner.

CASE.—Private Samuel D. Solomon, Co. G, 3d New Jersey Volunteers, was wounded in an engagement at Bull Run Bridge, August 27th, 1862, by a carbine ball, which struck at a point two inches behind the tip of the left ear and produced, apparently, only a scalp wound across the median line. He fell to the ground, but retained his consciousness. When seen by the surgeon, a probe was passed along the track of the missile the depth of two inches into the brain substance. The patient was sent to the 3d division hospital at Alexandria. The extent of the injury was not suspected, and the case was treated as a superficial scalp wound. On September 3d, he was admitted to the Broad and Cherry Streets Hospital, Philadelphia. Healthy suppuration continued, and a fragment of bone was discharged from the wound. On November 6th, the wound had healed, and the patient was returned to duty. Two days later he was admitted to the Ryland Chapel Hospital, Washington, suffering from a large abscess in the left ear. On December 5th, he was transferred to the Stanton Hospital. The discharge from the ear had not altogether ceased, and he was suffering constant headache, which was greatly increased by exposure to cold air; he also suffered from acute darting pains across the base of brain, from the right temple to the scar of the wound. No paralysis existed and the functions of the body were generally well performed. The cicatrix, though tender, was firm. After a few days, he was allowed, at his own request, to serve in the capacity of nurse; but, in two weeks' time, he was relieved from this task, as the pain and vertigo were unduly increased, and he was becoming pale and emaciated. He was discharged the service January 19th, 1863. Surgeon John A. Lidell, U. S. V., who reports the case, states, that it was the opinion of several surgeons, who examined the injury, that the missile still lodged in the cranial cavity. On March 2d, 1870, his claim for pension was still pending, and his disability rated three-fourths and probably permanent.

CASE.—Sergeant Walter Rotherham, Co. D, 7th New Jersey Volunteers, aged 23 years, was wounded at Gettysburg, July 2d, 1863, by a musket ball, which penetrated the skull near the right frontal eminence, passed directly inward and lodged somewhere on the membranes or in the brain substance. He was admitted to the hospital of the 2d division, Third Corps, and on July 10th, was sent to the Jarvis Hospital at Baltimore. The opening through the bone was similar to that made by a trephine, and the track of the ball could be followed on the dura mater with a probe for a considerable distance, as that membrane was detached from its natural connections with the skull. The patient was unable to say whether there had been much hæmorrhage or not. The parts were still open, and in making an exploration, the little finger could be readily inserted through the fracture, but no jagged bone pressing inward could be detected. The membranes were not lacerated at the seat of injury. The pulsations of the brain could be distinctly felt, and it was apparent that the ball had not rebounded or dropped out, but had followed a course toward the back of the skull where it still was concealed. The patient further stated that, on recovering his senses, he was not in the least paralyzed, and was able to converse, and that his surgeon said: "you cannot possibly live." After a few hours, he again became insensible and remained so for two days, when consciousness again returned. The patient, on admission, was able to sit up, stand, and walk, but he carried his head backward, resting between the shoulders, and complained of great pain and dizziness, if he attempted to change it to an erect position. There was no perceptible loss of power, motion,

or sensation on either side of his body. He was directed to be put to bed, and quiet was enjoined. His hair was then cut short, and cold water dressings were applied. There being no arterial excitement, the treatment was chiefly expectant. His recovery was rapid, and on August 12th, he was furloughed for fifteen days, at the expiration of which time he returned, having suffered no inconvenience from the journey. The wound, however, had not entirely closed, and since that date several pieces of bone have exfoliated. He was transferred to the Veteran Reserve Corps and was assigned to light duty in the hospital, but it soon became evident that he was permanently disabled, and he was discharged the service December 19th, 1863, at which time he complained of a constant dull, heavy pain at the back of his head. At night he suffered from unpleasant dreams and hallucinations, which sometimes caused him to wake in a state of great terror. His bowels were obstinately constipated, but were readily relieved by mild cathartics. Occasionally he was annoyed by nausea and vomiting after eating his meals. His mind was not impaired to any perceptible degree. He is not a pensioner. The case is reported by Assistant Surgeon D. C. Peters, U. S. Army.

CASE.—Private Elijah Lanning, Co. K, 79th Pennsylvania Volunteers, was struck by a missile at the battle of Chickamauga, Georgia, September 19th, 1863, which penetrated the right parietal bone. No particulars of the case can be obtained until February 17th, 1864, when the patient was admitted to the field hospital at Chattanooga, Tennessee. He received a furlough in March, and at its expiration, April 27th, was transferred to the York Hospital, Pennsylvania, suffering at the time from paralysis. On October 5th, 1864, he was mustered out of service and pensioned. A month after, Pension Examiner S. Cleizer reports the ball still remaining within the cranium, causing paralysis of the left arm and both lower extremities, and rates his disability total and likely to be permanent.

Missiles Extracted from within the Cranium.—In many cases attempts were made to remove projectiles which had penetrated the cranial cavity, and even imbedded themselves in the substance of the cerebral hemispheres. Though most of these cases had a fatal termination, the evidence seems conclusive that, in a few, this operation was successfully accomplished:

CASE.—Lieutenant Andrew M. Brown, 15th U. S. Infantry, received at the battle of Wilson's Creek, Missouri, August 10th, 1861, a penetrating gunshot wound of the cranium. On the same day, he was admitted to the hospital at Springfield. He recovered, and was returned to his regiment, then the 1st Missouri Infantry, for duty. The ball was successfully removed from the wound in 1868, seven years after the reception of the injury. In January, 1871, this officer was on duty as a Captain in the 13th Infantry.

CASE.—Corporal David Patterson, Co. E, 8th New Jersey Volunteers, aged 37 years, was wounded at the battle of Chancellorsville, May 3d, 1863, by a conoidal ball, which penetrated the left parietal bone. He was admitted to the Log Hospital, Chancellorsville, and on June 8th, was sent to the Mower Hospital, Philadelphia. The ball had been extracted prior to admission, and several pieces of bone had come away. The pulsations of the brain were visible through the wound. During the months of June, July, August, and September, fragments of bone continued to come away, but on October 20th, the wound had healed with the exception of a small point. He had been transferred to the Veteran Reserve Corps on August 20th, 1863. On September 1st, 1864, he was discharged the service and pensioned. Subsequent information states that the patient's symptoms, indicating lesion of the brain, are on the increase. His disability is rated one-half.

CASE.—Private Joseph Shortz, Co. A, 15th United States Infantry, aged 25 years, was wounded in an engagement at Jonesboro', Georgia, September 1st, 1864, by a conoidal musket ball, which penetrated the frontal bone on the right side and lodged. He was immediately admitted to the hospital of the 1st division, Fourteenth Corps, suffering, apparently, little from the shock of the injury, and nothing of special note is mentioned until the 12th, when the operation of extracting the missile was successfully performed. No ill results ensued. He was kept quiet in his quarters until the 23d of October, when he was transferred, by way of Chattanooga, to Nashville, Tennessee, where he was admitted into Hospital No. 1, on October 27th. On November 2d, he was furloughed, and on December 20th, was admitted to the hospital at Keokuk, Iowa. At the expiration of his term of service on the 22d of February, 1865, he was transferred to Davenport, Iowa, for muster out. He is not a pensioner.

CASE.—Private Edward Ware, Co. F, 13th Iowa Volunteers, aged 24 years, was wounded near Atlanta, Georgia, July 20th, 1864, by a conoidal musket ball, which fractured both tables of the frontal bone at the upper border, left side, and penetrated the brain. He was admitted to the hospital of the 4th division, Seventeenth Corps on July 30th; on August 3d, was transferred to the hospital of the Seventeenth Corps, and on August 10th was sent north. No records of the case can be found until December 19th, when Ware was admitted to the hospital at Keokuk, Iowa, from furlough. The ball had been removed by incision on November 6th, 1864, and simple dressings had been applied. The wound was still open, but looked healthy. On January 2d, 1865, Ware was transferred to Davenport, Iowa, for muster out, and discharged June 2d, 1865, and pensioned. Subsequent information states that this man is a confirmed epileptic.

CASE.—Private Morris Winkler, Co. C, 26th Wisconsin Volunteers, was wounded at Gettysburg, July 1st, 1863, by a missile which penetrated the frontal bone near the right eminence and entered the brain. He was admitted to the Seminary Hospital, and on July 8th, was sent to Twenty-fourth and South Streets Hospital, Philadelphia, where the missile was removed by Acting Assistant Surgeon F. F. Maury. The patient recovered, and on September 17th, 1864, was transferred to the Veteran Reserve Corps. He was discharged the service June 30th, 1865, and pensioned on June 23d, 1868. Pension Examiner L. D. McIntosh, reports that the patient suffered impairment of sight in the right eye, dizziness and headache. His disability is rated total and permanent.

CASE.—Private William Duffy, Co. F, 69th New York Volunteers, aged 28 years, was wounded at Antietam, September 17th, 1862, by a conoidal ball, which entered the left parietal about its junction with the squamous portion of the temporal bone, passed downward and backward, and lodged in the substance of the brain. He was insensible about an hour, at the expiration of which time the missile was removed. The right arm and hand were paralyzed. The patient was admitted to the Sixteenth and Filbert Streets Hospital, Philadelphia, September 26th, 1862, where he gradually recovered, under expectant treatment. He was sent to the Ladies' Home Hospital, New York City, May 26th, 1863, and was transferred to the Veteran Reserve Corps July 29th, 1863. He had nearly recovered the use of his hand and arm. Acting Assistant Surgeon J. W. S. Norris reports the case. This man was discharged the service November 4th, 1864, and pensioned. On April 7th, 1869, Pension Examiner J. Neill reports him suffering from paralysis of the right arm, with defective articulation, and rates his disability total and permanent.

CASE.—Private William E. Chapman, Co. E, 69th New York Volunteers, was wounded near Petersburg, Virginia, March 25th, 1865, by a conoidal musket ball, which caused a penetrating fracture of the temporal bone. He was, on the same day, admitted to the hospital of the 1st division, Second Corps, and thence was conveyed to Washington, and admitted to the Campbell Hospital, on March 28th, where the missile was removed. He was discharged on May 30th, 1865. On May 15th, 1868, Pension Examiner M. C. Hazen reported that, from time to time, pieces of bone have been discharged from the ear. There was a constant discharge from the ear, with a continued dull pain in the head, and the jaw was anchylosed. His disability is rated three-fourths and temporary.

CASE.—Sergeant Frank D. Hamilton, Co. E, 28th Massachusetts Volunteers, aged 22 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball, which apparently produced, only a scalp wound. He was sent to the hospital of the 1st division, Second Corps, thence was conveyed to Washington, and on the 7th, admitted to the Harewood Hospital. On June 16th, he was transferred to the Knight Hospital at New Haven, Connecticut, where it was discovered that the frontal bone had been fractured. The treatment throughout was of a simple character. In November, the patient was sent to the Dale Hospital, Worcester, Massachusetts; was discharged from service on the 3d of January, 1865, and pensioned, his disability being rated total and permanent. On March 5th, 1868, Pension Examiner C. L. Fisk, jr., reported that the ball had been extracted from the brain, but that the patient had been much prostrated ever since, and was growing worse.

CASE.—Commissary Sergeant Abraham F. Debaun, Co. I, 1st Kentucky Cavalry, was wounded at Fair Garden, Tennessee, January 28th, 1864, by a conoidal ball, which entered the forehead at the right superciliary ridge, and passing backward and outward, apparently emerged immediately behind the right eye. He was admitted, on February 1st, to the hospital at Knoxville, Tennessee. On February 7th, he was returned to duty; but, on February 12th, was again admitted to hospital No. 1, Nashville. The wounds of entrance and of exit had cicatrized, and the patient suffered little or no inconvenience. On February 13th, he was transferred to Frankfort, Kentucky, and was discharged December 31st, 1864, suffering from headache, neuralgia, and heaviness about the head, with occasional dimness of vision and almost constant discharge from the wound of a dirty sanious pus. In 1870, he came to Dr. Preston Peter at Louisville, Kentucky. The symptoms were the same as at the date of his discharge, and occasionally, when the wound became temporarily closed or failed to discharge freely, he would become sleepy, approaching an apoplectic coma, and the sight of the eye would be much impaired. An operation for the purpose of removing, as was supposed, depressed and necrosed bone, was decided upon and performed by Dr. D. Cummins, assisted by Drs. J. A. Brady and P. Peter. A crucial incision was made directly over the point of entrance at the internal angle of the right superciliary ridge; a fungous and cartilaginous growth was now removed, and numerous small vessels ligated. An opening through the external table of the frontal bone was then discovered, and upon trimming off the ragged edge with bone-pliers, evidences of lead were found. An elevator was introduced, and two pieces of lead, each about one-third the size of an ounce ball, besides numerous small particles, all lying in the right frontal sinus, were removed. When this was done, the internal table was found to be slightly depressed, with an opening in the depression communicating with the dura mater opposite the site of the fragments of lead. As the patient had never suffered from epilepsy, it was not deemed advisable to remove the depressed bone. The wound was closed with sutures, and isinglass plaster and water dressings were applied. He improved rapidly, without any untoward symptoms, and in ten days left for his home. In August, 1870, the patient was hearty, had gained considerable flesh, and was free from headache, neuralgia, dimness of vision, or anything of the kind. He is a pensioner.[1]

CASE.—Private Jonathan U. Smith, Co. K, 20th Ohio Volunteers, aged 20, was wounded at Goldsboro', North Carolina, by a missile, which struck near the centre of the left parietal bone and carried away a portion. The ball was removed seven days after the reception of the injury. The patient was discharged the service April 3d, 1865, and pensioned. Subsequent information, dated June 15th, 1865, states that he was unable to exert himself without severe pain in the head, and that he was affected by the vicissitudes of the weather. His disability was rated three-fourths and temporary.

CASE.—Private Andrew Gallagher, Co. D, 11th U. S. Infantry, was wounded at Gettysburg, July, 1863, by a conoidal ball, which struck on the outer side of the left orbit, penetrated behind the eye and lodged. He was admitted to the hospital of the 2d division, Fifth Corps, and on July 13th, was sent to the Camden Street Hospital at Baltimore. On September 25th, he was sent to Fort Independence, Boston Harbor, and there discharged from service on January 5th, 1864. On April 28th, 1864, Pension Examiner W. S. Searle reports that the ball had been extracted, but the vision of the eye was gone; the eyeball was one-third less in size, and the pupil was insensible to light. Sudden shocks would give great pain in the eye; the loss of memory was almost complete, and much pain was felt in the hand. He rated his disability total and permanent.

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1 This case is reported in the *American Practitioner*, Vol. II, p. 332, Louisville, 1870.

The successful removals of projectiles from the cranial cavity were exceptional. In the majority of cases such attempts were unavailing. Yet a temporary amendment was observed in a number of interesting cases of extraction of balls from the interior of the skull:

CASE.—Captain Ezra Dickerman, Co. I, 20th Connecticut Volunteers, aged 23 years, was wounded at the battle of Peach Tree Creek, Georgia, July 20th 1864. The missile entered about an inch behind and on a level with the outer angle of the left eye, passed inward and forward, and carried away a portion of the anterior surface of the greater wing of sphenoid, one-eighth of an inch in diameter. He was sent to the hospital of the Twentieth Corps, which he reached in an insensible condition. Attempts were made to find the ball, but without success. He remained unconscious for several days, and was, in the meantime, transferred to Vining's Station, thence to Chattanooga, which place he reached on July 27th. He had at that time become rational, and complained of pain, but was delirious at times. On July 31st, he was sent to Officers' Hospital, Nashville, bearing the journey well. On August 1st, at his own request, chloroform was administered, and a second search was made for the ball, which was found lodged in or near the ethmoid bone. So firmly was it imbedded, that it took two assistants to hold the head, while the surgeon, wrapping his handkerchief round the handle of the forceps, was obliged to pull with all his strength. The operation resulted favorably, and in a week the patient left for his home in Connecticut. There was complete loss of sight and smell of left side, and the hearing was much impaired. The orbit of the left eye itself was not perceptibly injured, and singularly enough the iris responded freely to the action of light. The patient showed a general want of intellectual vigor, but with the exception of a loss of memory, no faculty seemed to have especially suffered. He remained on light duty until May, 1865, when he joined his regiment, and was mustered out June 13th, 1865. But he had not recovered; working in the sun or severe mental application would invariably bring on vertigo and headache. In the summer of 1866, an epileptic convulsion supervened, lasting about fifteen minutes. Subsequent prostration was relieved by tonic treatment, and in a week he was as well as before the attack. Six months later he had a severe attack of colic; the following day a second epileptic attack occurred, this time very slight, with only momentary loss of consciousness. A third attack occurred in December, 1867; there were no convulsions, but rigidity and unconsciousness lasted about half an hour. Foaming at the mouth and a dull heavy pain in the forehead supervened, with frequent pulse and considerable languor. Facial neuralgia along the portio dura followed, and continued for three days, when all pain ceased; drowsiness came on, which passed into coma, and death occurred December 22d, 1867. At the post-mortem examination the dura mater was found much congested over the whole upper surface. On its summit was found a deeply congested spot an inch in diameter. On separating the two layers of the arachnoid, transparent threads of lymph were seen passing from one to the other. At the apex of the brain, corresponding to the deeply congested spot on the dura mater, and dipping down between the hemispheres, more firmly organized lymph was found, uniting the layers of the arachnoid so firmly that they were only separated with difficulty. The substance of the brain presented a healthy appearanee, and the ventricles contained no fluid. At the bottom of the middle lobe of the left hemisphere, an abscess was found containing two or three ounces of dark-colored and offensive pus. The membrane which formed the cyst was firmly united together and to the bone beneath; the upper portion was delicate and transparent like the arachnoid; the bone was neither roughened nor discolored. At the anterior border of the portion of abscess adherent to the bone was a small orifice one-eighth of an inch in diameter communicating with the pterygoid fossa, on a line with the track of the ball and evidently caused by it. The case is reported by Surgeon J. Wadsworth Terry, 20th Connecticut Volunteers.

CASE.—Private C. W———, Co. E, 14th West Virginia Volunteers, aged 22 years, was admitted to the general hospital at Frederick, Maryland, September 17th, 1864, coming by rail from the hospital at Sandy Hook, having been wounded at Berryville, Virginia, on September 3d, by a conoidal musket ball which entered the left temporal bone an inch above the auditory meatus, passed inward and forward, and a little upward. Acting Assistant Surgeon J. H. Bartholf reports that he passed a probe with great freedom four and a half inches into the wound. There was paralysis of the second, third, fourth, fifth, sixth and seventh cranial nerves of the left side, and total blindness of the left eye, with dilatation of the pupil and insensibility of the iris and retina, anæsthesia of the cornea and conjunctiva of the left half of the face. On one occasion a pin was stuck into the scalp of the forehead by an awkward nurse and the patient did not know of the accident. The facial and masticating muscles of the left side were powerless. He had perception of strong odors, as of the vapor of ammonia. He was totally deaf in the left ear. The left corner of his mouth drooped; the left eyelids remained open. The discharge from the wound was considerable. The wound did not communicate with the external auditory canal; but in about a week an abscess opened and discharged through this channel. The patient was tolerably strong and his general condition was very fair. The patient had no headache, his pulse, skin and bowels were normal; he was perfectly conscious; his articulation thick, but improving daily. On September 18th, Acting Asistant Surgeon Bartholf succeeded in finding and extracting from an inch and a half within the skull one-third of a conical bullet. From that time onward the patient rapidly improved. The removal of the foreign body was immediately followed by a very free flow of pus. On September 20th there was some vision of the left eye. The next day the patient could count figures held near the eye. The hearing of the left ear returned sufficiently for the patient to hear loud speaking. By October 10th the patient was going about the ward in comparatively good health, except that there was ptosis, a little discharge from the ear and slight suppurations from the entrance wound. The patient voluntarily assisted in nursing, but becoming fatigued complained of slight pain in his temple. On November 2d, two months after the reception of his wound, the patient was transferred to the hospital at Grafton, West Virginia, whence Surgeon M. G. Sherman, U. S. V., wrote to Assistant Surgeon R. F. Weir, U. S. A., that the wound was healed when the patient came to him, but that there was some discharge from the ear; that he had learned from the attendants that the patient had drank immoderately of spirits on his way from Frederick to Grafton; one of the nurses stating that he drank at least a quart of whiskey on the day prior to his arrival at Grafton. Yet he seemed tolerably well on the day of his arrival and on the following day; but on November 4th

he had a severe chill in the morning, and on the 5th convulsions with strabismus of the right eye-ball. On the morning of the 6th he died, after a convulsion accompanied by opisthotonos. Twenty-eight hours after death a post mortem examination was made. After removing the calvaria and the brain, a portion of a conoidal musket ball, comprising nearly two-thirds of the missile, was found resting against the sella Turcica, having traversed the long diameter of the temporal, being cut off very clean. Dr. Sherman adds that he understands that the other third of the ball was removed from beneath the scalp; but Dr. Bartholf's notes are conclusive as to the position of the other fragment. Dr. Sherman preserved the patient's skull with a view of forwarding it with a history of the case to the Surgeon General's Office; but the specimen was never received at the Army Medical Museum. The notes furnished by Dr. Bartholf, and a conversation of Dr. Sherman with the editor of this work, have permitted the completion of this history. The fragment of the bullet, extracted by Assistant Surgeon Bartholf, is figured in the adjacent wood-cut. It weighs nearly half an ounce.

FIG. 100.—Fragments of ball extracted from the brain. *Sp.* 5555, Sect. I, A. M. M.

CASE.—Private *O. R. Lawless,* Co. E, 28th Virginia Regiment, aged 45 years, received, near Richmond, Virginia, June 17th, 1864, a penetrating gunshot fracture of the frontal bone, the missile entering near the left eminence. On the following day he was admitted to Chimborazo Hospital No. 5 at Richmond, where the ball was extracted and expectant treatment was used. The patient suffered some pain, but was in good condition, the tongue being natural, and pulse seventy-two, but intermittent. On June 20th he was in possession of all his faculties and doing well, and on June 22d the pulsations were visible through the wound. On June 26th his pulse was natural, but he kept his eyes closed, only opening them when spoken to. He answered questions, but was little inclined to talk. There was a collection of pus which rose and fell with the pulsation of the brain. The patient died June 27th, 1864, without exhibiting any violent symptoms.

CASE.—Private Francis Donohue, Co. B, 83d Pennsylvania Volunteers, aged 19 years, was wounded at the South Side Railroad, Virginia, March 31st, 1865, by a conoidal projectile which penetrated the frontal bone one inch above the right frontal eminence. He was sent to the hospital of the 1st division, Fifth Corps, and thence was conveyed to Washington and admitted to the Lincoln Hospital on April 4th. On the 13th, the patient being in a comatose condition, Acting Assistant Surgeon John Morris extracted a large portion of the frontal bone and removed the ball. There was extensive laceration of the integument and considerable comminution of bone. Considerable brain substance escaped through the opening in the cranium. Expectant treatment was resorted to, in spite of which the patient sank rapidly and died April 16th, 1865. A post-mortem examination revealed a large abscess in the anterior lobe of the right hemisphere. The case is reported by Surgeon J. C. McKee, U. S. A.

CASE.—Private Thomas J. C———, Co. B, 28th New York Volunteers, was wounded at the battle of Antietam, September 17th, 1862, by a spherical projectile which entered near the centre of the forehead, passed downward through the anterior lobe of the right hemisphere, penetrating the roof of the orbit and lodging near the apex. He was conveyed by rail to Philadelphia, a distance of one hundred and fifty miles, and was admitted to 24th and South streets Hospital on September 26th, 1862. The right eye, which was in a sloughing condition, was extirpated next day and the missile removed. Death occurred October 4th, 1862. At the autopsy a large abscess was found behind the orbit pressing on the base of the brain, with extensive softening and infiltration in its vicinity. The pathological specimen is No. 216, Sect. I, A. M. M. A section of frontal bone perforated just above the inner angle of the right orbit. The fractured portion, externally, measures one inch in diameter; and three depressed fragments of the anterior wall of the sinus remain attached to the edge of the opening. Two square inches of the inner table have been carried away, including a portion of the orbital plate. A fissure extends downward through the entire thickness of the supra-orbital arch, and a second fissure traverses the plate of bone between the frontal sinuses. The specimen was contributed by Surgeon J. Hopkinson, U. S. V.

CASE.—Sergeant *J. Wilds Williamson,* Co. B, 21st South Carolina Cavalry, aged 27 years, was admitted in May, 1864, to South Carolina Hospital, Petersburg, Virginia, with a gunshot fracture of the skull, received May 6th, 1864. The missile, which had entered the centre of the occipital bone, was extracted on the field. Considerable loss of brain matter ensued, and the patient died May 10th, 1864.

CASE.—Sergeant Aurelius A. Robinson, Co. I, 17th Maine Volunteers, was wounded at the battle of Gettysburg, July 2d, 1863, by a conoidal ball which struck the forehead, penetrated the outer table of the skull, and became impacted in the inner table. He was sent to the 1st division hospital of the Third Corps. On examination, the ball was found flattened quite thin, with very ragged edges. These points and indentions were so closely matched by corresponding points and depressions on the skull, that a fine probe could not be inserted between them. The ball was removed with forceps by Surgeon H. F. Lyster, 5th Michigan Volunteers. The case proved fatal July 6th, 1863.

CASE.—Private Montellion Smith, Co. H, 5th Vermont Volunteers, aged 39 years, was wounded at the battle of Cedar Creek, Virginia, October 19th, 1864, by a conoidal musket ball, which struck the squamous portion of the left temporal bone. The ball was extracted on the field. He was admitted to the hospital of the 2d division, Sixth Corps, and on October 23d, was sent to the Cuyler Hospital, Philadelphia. The patient stated that he was stunned and unconscious for five hours after the reception of the injury. On admission, the wound looked favorable. On the 26th, his memory began to fail, articulation became difficult, and stupor and muttering delirium followed. On the 28th, the wound was enlarged, when an extensive fracture of the bone was disclosed. Cold water dressings were applied continuously; the pupils of the left eye became much contracted, urine passed involuntarily, and death occurred on November 3d, 1864. At the autopsy, several fragments of bone were found imbedded in the brain substance. The dura mater near the wound was disorganized and coated with a purulent and lymphy deposit. A large abscess extended to, but did not open into, the lateral ventricle; there was considerable interstitial congestion through the brain.

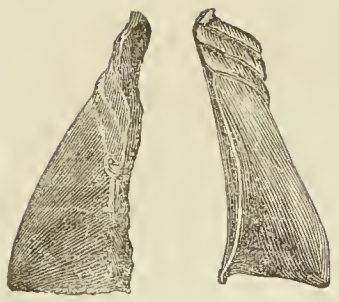


FIG. 101.—Two lateral views of a fragment of a conoidal ball split upon the skull. *Spec.* 4150, Sect. I, A. M. M.

CASE.—Corporal *McD*———, Troop F, 6th South Carolina Cavalry, was wounded February 10th, 1864, by a conoidal ball, which perforated the skull under the superior curved line of the right side of the occipital bone. He was admitted to the field hospital at John's Island, South Carolina, on the same day. The perforation was round and smooth, and allowed the entrance of a body no more than one and three-eighths of an inch in circumference, the ball having perforated the occipital with the apex only, falling out afterward. After diligent search, half of the missile was found under the scalp, one inch from the original injury, and was easily removed. The patient died February 11th, 1864. The missile, a conoidal ball, which appears to have struck base first, obliquely flattened, and from which a portion is wanting, is represented in the adjacent wood-cut. It was contributed by Surgeon S. Brillantowski, 41st New York Volunteers.

CASE.—Corporal John Sponsler, Co. H, 48th Pennsylvania Volunteers, was wounded at Campbell's Station, near Knoxville, Tennessee, on November 29th, 1863, by the plug of a shell, which passed through the skull near the coronal suture. He was admitted to the field hospital of the Ninth Corps, where Surgeon A. M. Wilder, U. S. V., removed the plug from the anterior portion of the brain. Death supervened in a few hours after the operation.

CASE.—Lieutenant Colonel Cornelius W. Tolles, chief quartermaster Middle Military Division, was attacked on the 11th of October, 1864, by a band of guerillas as he was passing through Newtown, Virginia, on his way to the front. Although he surrendered without resistance, one of the treacherous party, stepping behind the Colonel, shot him in the head. The missile, a pistol ball, penetrated the cranial cavity through the occipital bone at a point midway between the superior angle and the curved line, three-fourths of an inch to the left of the median line, making a clean perforation and lodging in the posterior lobe of the cerebrum one-half inch deep. He was conveyed to Winchester, and placed under the care of Dr. Emanuel, Acting Staff Surgeon, U. S. A. This officer states that the wound suppurated well, and caused no pain; the patient's mental faculties remained unimpaired, and his appetite good, so that a favorable prognosis was granted. On October 22d, the ball was extracted in small fragments. About the end of October, evacuations of the fæces and urine began to occur involuntarily; on the 31st, there was an entire suppression of the urine, as ascertained by the introduction of the catheter, and the fæces were again discharged involuntarily. On the 4th of November, the vision and hearing became defective. Delirium ensued, and death occurred on November 7th, 1864. Upon removing the calvaria, at the autopsy, the dura mater around the wound was found ecchymosed, and the cavity in the cerebrum, which was about one-half inch deep, filled with purulent and offensive pus, and lined with plastic filamentous fibrin. A fragment of bone, about three-fourths of an inch in diameter, was extracted from a point just below. The pia mater had suffered morbid changes. A sero-purulent fluid was found in the inferior and posterior depressions of the lateral ventricles, and likewise in the fourth ventricle, the lining membrane of which cavity had undergone softening, as had also the sheaths of the roots of the seventh, eighth, and ninth pairs of nerves, which were of a greenish hue; the optic commissure was congested. The substance of the encephalon was sound throughout. The semi-lunar lobe of the left lateral hemisphere of the cerebellum was firmly adherent to the tentorium. The case is reported by Acting Assistant Surgeon W. L. Hammond.

CASE.—Private *A. A. Watson*, Co. B, 48th North Carolina Regiment, was, on June 7th, 1864, admitted to hospital No. 24, Richmond, Virginia, with a gunshot fracture of the skull. The missile entered at the right protuberance of the frontal bone, passed through and lodged. He was speechless until June 9th. An abscess formed on the back part of the head, which was opened on June 12th, and the ball removed. Slight improvement followed, but in a few days the wound became very offensive. The patient slept nearly all the time until death ensued, June 20th, 1864.

The following cases of penetrating gunshot fractures of the head terminated fatally:

CASE.—Private D. C———, Co. D, 10th Pennsylvania Reserves, aged 26 years, was wounded near Old Church, Virginia, May 30th, 1864, by a conoidal ball, which fractured the anterior inferior angle of the right parietal bone and lodged in the brain. He was admitted to the hospital, 3d division, Fifth Corps, on the same day, and was transferred to the Stanton Hospital at Washington, on the 4th of June. Several fragments of bone were removed. A cerebral abscess formed, and death ensued on the 11th. The pathological specimen, No. 2682, Sect. I, A. M. M., is a section of cranium, from which fragments have been removed for a distance of two inches from before backward, and one-half inch in width; a fragment, half an inch long, remains *in situ*. The inner table is fractured to a somewhat greater extent, and two small fragments remain, with their free edges slightly depressed. There is caries of the fractured surface, but no distinct attempt at repair. The specimen and history were contributed by Assistant Surgeon G. A. Mursick, U. S. V.

CASE.—Sergeant George W. Burtiss, Co. G, 173d New York Volunteers, was accidentally wounded, on January 23d, 1864, by a pistol ball, which fractured the cranium and lodged in the left side of the brain. He became unconscious and was taken to the regimental hospital. Ten minutes after the accident his countenance was livid, pulse slow and full, respiration labored and spasmodic. Some reaction took place now and he cried out to have his face wiped. He struggled to get up to urinate and begged his attendants to let him go out of the tent for that purpose, but he could not pass any urine. In half an hour he relapsed into a quiet state. The pulse continued slow but irregular, and occasionally spasmodic movements of the extremities occurred. The pupils were not affected by strong light. The patient died nine hours after the reception of the injury. At the autopsy two small wounds were found, one incised, about one inch above the left eyebrow. The areolar tissue of the left eyelid and surrounding the wounded parts were infiltrated with blood. Several spiculæ of bone and a small scale of lead were lodged in the soft parts near the wound. A circular opening about a half inch in diameter through the external, and three-fourths of an inch through the internal table, was found in the frontal bone about one inch above the left superciliary ridge.

Between the skull and dura mater were several spiculæ of bone. The left hemisphere of the cerebrum was extensively lacerated through its longitudinal diameter. The bullet was found in the posterior lobe of left hemisphere near the dura mater. Large clots of blood covered the left hemisphere and lay at the base of the brain, surrounding the upper extremity of the spinal cord. The case is reported by Surgeon N. W. Leighton, 173d New York Volunteers.

CASE.—Private Anton Lambert, Co. E, 9th Kansas Cavalry, was wounded in a skirmish with guerillas near Westport, Missouri, June 17th, 1863, by a conoidal ball which passed through the mastoid process of the right temporal bone, and fractured a part of the petrous portion at its union with the jugular process of the occipital. On the following day he was admitted to the hospital at Kansas City, Missouri, but died June 20th, 1863. The autopsy revealed a rupture of the lateral sinus. The ball had glanced forward, destroying the labyrinth; had passed under the basilar process of the occipital bone, and had lodged in the masseter muscle, near the coronoid process of the lower jaw.

CASE.—Sergeant G. C———, Co. A, 11th New Jersey Volunteers, aged 26 years, was wounded at the battle of Chancellorsville, May 3d, 1863, by a musket ball, which penetrated the right temporal bone, and lodged deeply in the substance of the brain. He was conveyed to Washington, and on the 7th, was admitted to the Douglas Hospital. Hemiplegia of the left side existed at the time of his admission; the pupil of the right eye was much dilated, and brain substance was protruding from the wound of entrance. Simple dressings were applied to the wound, and expectant treatment was had recourse to; but he died on the 11th of the month. At the autopsy, the missile was found lodged behind the sella Turcica. It was a bullet, with a deep groove containing a fragment of the temporal bone, contributed, with its history, by Acting Assistant Surgeon John O. Smith.

FIG. 102.—Round ball lodged in the cerebrum. *Sp.* 1288, Sect. I, A. M. M.

CASE.—Private E. G———, 18th Indiana Battery, aged 25 years, was accidentally wounded on January 7th, 1865, by a pistol ball which penetrated the cranium one inch above the superciliary ridge and three-fourths of an inch to the left of the median line. He was sent to Hospital No. 8, at Nashville, in a semi-conscious condition. Digital examination revealed a circular, well defined opening through the os frontis, corresponding with the tegumentary opening. A gum-elastic bougie could be passed two and a half inches in the track of the ball antero-posteriorly through left hemisphere. Brain substance escaped. On January 9th the wound of entrance through the scalp was enlarged to promote free discharge of pus; clots of brain substance continued to escape. On January 10th the patient talked incoherently, his respiration was slow and sighing, face flushed, and pupils natural. On January 12th he was unable to speak; coma supervened and death occurred January 14th, 1865. The ball had traversed the whole length of the left hemisphere, its course being easily distinguished by the black, sloughing, ragged appearance of the track, which terminated at the occipital without rupturing the membranes or fracturing the occipital bone. The entire encephalon, with the exception of parts immediately around the track of the missile, presented a normal appearance. The cranial cavity was thoroughly explored, and the brain was cut into small pieces in order to find the ball, but the search was fruitless. The ball must have dropped out of the wound of entrance at some time when the face and head hung lower than the body. On no other theory can the absence of the ball be explained. The pathological specimen is No. 3747, Sect. 1, A. M. M., and was contributed by Assistant Surgeon C. C. Byrne, U. S. A., while the history of the case is reported by Acting Assistant Surgeon H. C. May.

CASE.—Private Alpheus Salisbury, Co. K, 7th Rhode Island Volunteers, was wounded at the battle of Fredericksburg, December 13th, 1862, by a piece of shell, which fractured the skull behind the right ear. On December 18th, he was admitted to Harewood Hospital, Washington, and on January 10th, 1863, was sent to Lovell Hospital, Portsmouth Grove, Rhode Island. He was discharged March 19th, 1863, and died July 2d, 1863, his widow receiving a pension from that date. Doctor William H. Bowen, in a report relative to this case says, that the most prominent symptoms were great pain in the head, frequent vomitings, constipation, and a kind of stupor. The wound in the head had not healed, and on probing it pus and blood were discharged. He learned that several pieces of bone had been taken away since the injury was inflicted. On July 1st, he saw the patient, in consultation with another physician. Pain in the head and vomiting still continued, and there was more perfect unconsciousness. The next morning there was paralysis of the side opposite the wound in the head, with one pupil contracted while the other was dilated, and he was perfectly comatose. He thinks that the wound was the primary and the original cause of death.

CASE.—Sergeant William B. Etter, Co. D, 16th Maine Volunteers, aged 26 years, was wounded at Fredericksburg, December 13th, 1862, by a piece of shell, which fractured both tables of the cranium at the vertex to the right of the median line. He was admitted to the 2d division, First Corps hospital. Partial paralysis of the left upper and lower extremities, involving the bladder, followed. On December 19th, the patient was transferred to Alexandria, and was admitted to the 3d division hospital. Stimulating lotions were applied to the extremities and a catheter was used for several days. He died on January 23d, 1863. The autopsy revealed the external table fissured to the left ear. A fragment of bone, one inch in diameter, was found pressing upon the brain; smaller fragments had penetrated its substance. The left pleura was covered with extensive and recent adhesions and studded with deposits of lymph and pus. The right lung contained a large number of abscesses. The case is reported by Surgeon E. Bentley, U. S. V.

CASE.—Private George Knapp, Co. D, 8th New Hampshire Volunteers, was accidentally wounded on October 29th, 1864, while on picket near Natchez, Mississippi, by a conoidal ball which struck the left side of the frontal bone over the superciliary ridge, about one and one-fourth inches to the left of the median line. The missile split; one-half lodged, the other penetrated the skull and passed deeply into the brain. It is recorded that the missile before wounding this man had passed through the body of a comrade. The patient was sent to hospital at Natchez, where a portion of the ball was removed. Coma, stertorous breathing, vomiting, and involuntary evacuations followed; and death occurred October 30th, 1864, twelve hours after reception of injury. The autopsy revealed an extensive depressed fracture at seat of wound and a line of fracture extending across the parietal bone to the lambdoid suture. One-half of the ball was found imbedded in the substance of the brain just above the sella Turcica. The left lateral ventricle contained a large coagulum extending into the track of the ball.

Case.—Corporal Gardner Gaylord, Co. B. 16th Massachusetts Volunteers, was wounded at the battle of Bull Run, Virginia, August 30th, 1862, by a conoidal ball which penetrated the cranium just above the right frontal eminence, causing a stellate fracture with cleanly cut edges. On September 1st he was admitted to the Judiciary Square Hospital, being perfectly conscious. All his functions remained normal; he was able to help himself and complained of no pain. On September 3d he became comatose, and died September 5th, 1862. At the autopsy the ball was found to have entered the anterior lobe of the right hemisphere, carrying with it fragments of bone and traversing the brain substance nearly the full extent of the hemisphere. At the point of entrance there was an abscess the size of a walnut, and the track of the ball was filled with pus. A small quantity was also found in the left ventricle. The case is reported by Surgeon Charles Page, U. S. A.

Case.—Private J. D———, Co. G, 5th Tennessee Regiment, aged 30 years, was wounded at the battle of Tunnel Hill, Georgia, April 30th, 1864, by a musket ball which fractured the frontal bone, traversed the brain and lodged. He was conveyed to Nashville, and on the 5th of May was admitted into hospital No. 1. Brain matter, yielding a thin, greenish, and fetid discharge, protruded from the wound, which evidently was of considerable extent. An examination of the wound was made and it was ascertained that a plate of the central portion of the frontal bone had been displaced so as to project half an inch or so, thus allowing free protrusion of the cerebral substance. The surrounding soft parts were of course much inflamed and swollen. The patient was perfectly rational and would answer questions promptly, though he had no inclination to converse, and if left undisturbed, would sleep the greater part of the time. The pulse was alternately strong and intermittent. The digestive functions remained undisturbed. The patient did not complain of much pain, and could stand and walk. The treatment was expectant; but the patient gradually sunk into a comatose state, though when fully aroused he would recognize the attendants, and make his desires known, as late as May 14th. Death took place on May 15th, 1864. At the autopsy the displaced fragment of the frontal bone was found to measure four and a half inches in diameter. A fissure passed downward separating a part of the great ala of the sphenoid and the squamous portion of the temporal bone. The missile was found in the vicinity of the left great wing of the sphenoid against which it had struck, the point of contact being evident by discoloration as well as by a slight fissure of the vitreous table. The pathological specimen with history was contributed by Surgeon R. S. Stanford, U. S. V. It is numbered 3358 in the surgical section of the museum.

Case.—Captain W. E. Tucker, Co. B, 67th Pennsylvania Volunteers, was wounded at Annapolis, Maryland, October 29th, 1862, by a conoidal ball which fractured and depressed both tables of the os frontis one and a half inches above the left superciliary ridge and penetrated the brain. On the same day he was admitted to the 1st division hospital in a state of stupor with respiration labored, pupils contracted, and pulse full and slow. Upon probing the wound brain matter exuded. The treatment was expectant. Full consciousness was restored on the morning of the 30th, so that when aroused he readily recognized his friends and answered questions correctly. He soon relapsed into the former comatose condition. On the following day two small fragments of bone were discharged from the wound. On the morning of November 1st, a decided febrile action was established. The pulse rose from 55 to 90 and the skin became hot and dry. Tincture of aconite was administered in five-drop doses every two hours, and twelve hours afterward the dose was increased to ten drops, but failed to effect a reduction of the pulse, which had reached 160 on the 2d of November, when death occurred. No delirium existed at any time during the progress of the case. At the autopsy a small, smooth perforation was found to the left of the median line about three-eighths of an inch in diameter. The injury to the inner table was more extensive, covering three-fourths of an inch in diameter. Fragments of the inner table were driven into the anterior lobe of the left hemisphere and softening existed in their immediate vicinity. The missile, which weighed 32 grains, was traced diagonally downward through the corpus callosum to its place of lodgment beneath the posterior lobe of the right hemisphere. A large clot of blood surrounded the orifice in the cranium and purulent spots were present in the surface of the cerebrum. The lateral ventricle was filled with blood. The case is reported by Assistant Surgeon James W. Petinus, 67th Pennsylvania Volunteers.

Case.—Private Thomas Urch, Co. F, 211th Pennsylvania Volunteers, was wounded before Petersburg, Virginia, April 2d, 1865, by a conoidol ball which entered the brain through the frontal bone one and a half inches above the right eye. On the same day he was admitted to the hospital of the 3d division, Ninth Corps, and thence was conveyed to Armory Square Hospital, at Washington, which he entered on April 10th. An attempt was made on the following day to remove the ball, but was unsuccessful. Death from apoplexy occurred April 14th, 1865.

Case.—Private George Deal, Co. D, 148th New York Volunteers, aged 23 years, was wounded at the battle of Coal Harbor, Virginia, June 3d, 1864, by a conoidal musket ball, which penetrated the cranium and passed through the anterior portion of the cerebrum. He was admitted to the Eighteenth Corps Field Hospital, and on the 7th of June transferred to the Carver Hospital, Washington, D. C. The particulars in the progress of the case are not known. Death took place on the 8th of June, 1864.

Case.—Sergeant *Alexander E*———, Co. B, 56th North Carolina Regiment, aged 30 years, was wounded at Petersburg, March 28th, 1865, by a conoidal ball, which entered the body of the left malar bone, producing a comminuted fracture, passed from left to right through the orbit, fracturing the ethmoid bone, and lodged in the anterior portion of the base of brain on the right side. He was conveyed to a field hospital, and on March 30th was admitted to Lincoln Hospital, Washington, being nearly comatose. The probe could be passed into the brain. Death occurred on April 2d, 1865, from exhaustion and congestion. The autopsy revealed the course of the ball as above stated. The pathological specimen is No. 85, Sect. I, A. M. M., and consists of nine fragments, chiefly from the malar bones, and the ball, separated into two parts. The specimen, with the history, was contributed by Acting Assistant Surgeon T. P. Arthur.

Case.—Sergeant Charles B. Hummell, Co. D, 127th Pennsylvania Volunteers, aged 22 years, was wounded at the battle of Fredericksburg, Virginia, May 1, 1863, by a spherical case-shot which penetrated the right parietal bone near the junction of the sagittal and coronal sutures. On the morning of the 6th, he was conveyed by steamer to Washington, and was admitted to the

Stanton Hospital, in a state of unconsciousness, suffering from the shock of injury; his pulse was one hundred and sixty and very feeble. By the afternoon of that day he had rallied considerably, though he still remained insensible. No paralysis of any part of the body could be detected. He lay upon his back, apparently sleeping, his respiration being perfectly natural. During the examination of the pupils, which were found somewhat contracted, though still symmetrical, he exhibited manifestations of consciousness by offering some resistance. A probe was readily passed a considerable distance along the track of the missile into the brain substance. Very little hœmorrhage from the wound occurred. The patient swallowed without difficulty and passed his urine involuntarily. After shaving the head a bag of ice was applied; a stimulating injection was then employed, which acted well, and nutriment was given in the form of beef tea. The next morning the pulse was one hundred and fourteen and somewhat stronger; the pupils were natural in size, and contracted readily under the action of light. He readily flexed and extended his legs, raised his hands to his head, rubbed his eyes, which he kept closed, stretched and yawned like one awaking from a sound sleep, and endeavored to remove the ice bag. He manifested dislike to beef tea and seemed to recognize the sound of his name when addressed, but took no notice of surrounding objects. The enema was repeated. On the morning of the 9th, the pulse had risen to one hundred and thirty, with further dilatation of the right pupil. Half grain doses of calomel, with one-eighth grain of ipecac, were now given every eighth hour. On the 10th, stupor became profound, with paralysis of the right buccinator muscle. No other face muscles were involved and there were no convulsions or paralysis. On the 11th there was full dilitation of the right pupil, the left remaining natural. The respiration, still without stertor, was greatly increased in frequency, the diaphragm assisting but little in the breathing. The power of deglutition was lost and the right arm was partially paralyzed. The enema was repeated but the patient continued to sink, and died at eight P. M. on the 11th of May. At the autopsy, some fragments of bone were found at the wound of entrance. On removing the calvaria, a large quantity of serum, slightly tinged with blood, escaped from the cavity. The missile had passed downward, backward, and to the left side, into the left cerebral hemisphere. Several small pieces of bone, a piece of scalp, and some hair, were distributed along the track, around which, for the distance of half an inch, the brain was softened by inflammation. A large clot of blood lay along the right side of the falx cerebri. The pathological specimen, No. 1137, Sect. I, A. M. M., showing five fragments of bone, with a round bullet, removed at the autopsy, was contributed, with the history, by Surgeon John A. Lidell, U. S. A.

Case.—Lieutenant *John Harris*, of McIntyre's Command, C. S. A., aged 27 years, was wounded in action near Helena, Arkansas, about the middle of June, 1864, by a conoidal musket ball which detached the right ear and entered the cranial cavity at the junction of the parietal and occipital bones. He was admitted on June 24th into the general hospital at Helena. The wound soon became gangrenous, and death resulted on July 1st, 1864. No further particulars are recorded.

Case.—Private Alexander Johnson, Co. A, 102d U. S. Colored Troops, received at the battle of Pocotaligo, South Carolina, December 9th, 1864, a penetrating fracture of the cranium from a missile which entered at the right orbit and involved the brain. He was conveyed by hospital steamer to Beaufort and admitted into the general hospital on the 12th. The wound was dressed in the usual manner. On the 14th he was transferred to division hospital No. 2, at the same place. Death resulted on December 22d, 1864.

Case.—Private John Johnson, Co. H, 72d Indiana Volunteers, was wounded in the head in a skirmish at West Point, Mississippi, February 22d, 1864, by a musket ball which entered the cranial cavity on the left side and lodged in the substance of the brain. He was conveyed to Memphis, Tennessee, and admitted on the 27th into the Washington Hospital. Meningitis and coma supervened, and death resulted on the 11th of March, 1864. At the autopsy the ball was found, but the exact place of lodgement is not stated.

Case.—Captain John R. Lamrie, Co. D, 6th Wisconsin Volunteers, aged 28 years, was wounded at Hatcher's Run, Virginia, February 6th, 1865, by a conoidal ball, which penetrated the cranium. He was admitted to hospital 3d division, Fifth Corps, and on February 7th, sent to hospital of Fifth Corps at City Point. There was evidently compression of brain from extravasation of blood. He died February 16th, 1865. At the autopsy the greater longitudinal sinus was found perforated, and fragments of bone were lying loose upon the brain. Abscesses had formed in the superior and internal portion of each hemisphere and were in a suppurating condition.

Case.—Corporal *W. F. Lancaster*, Co. F, 3d Virginia Regiment, aged 24 years, was wounded at the battle of Gettysburg, July 1st, 1863, by a musket ball which penetrated the squamous portion of the right temporal bone, just above and anterior to the meatus auditorius and lodged. The missile was extracted on the field and the patient was conveyed to the Seminary Hospital, where he remained until the 20th of the month. He was then sent to West's Building Hospital, Baltimore, being at the time irritable, as his wound was painful, and his sleep at night disturbed. Cold-water dressings and expectant treatment were used. On the 1st of August short periods of delirium occurred, with quick, small pulse, which was followed by obstinate diarrhœa. By the 4th, delirium had become constant, terminating five days later in a state of partial stupor. Insensibility followed, on the morning of the 10th; his respiration becoming stertorous, pulse frequent and weak; and death occurred at five o'clock in the afternoon. At the autopsy, the portions of the squamous bone immediately surrounding the upper part of the perforation were found depressed nearly a fourth of an inch. The parietal, sphenoid, and frontal bones were also involved in the fracture, which measured three and a half by two inches. In the immediate vicinity of the fragments disorganization of the brain existed, but in the other parts its structure was healthy. The pathological specimen is No. 1720, Sect. I, A. M. M., and was contributed, with the history, by Assistant Surgeon E. Brooks, U. S. A.

Case.—Private J. O'Brien, Co. F, 47th Pennsylvania Volunteers, was wounded at the battle of Pocotaligo, South Carolina, October 22, 1862, by a musket ball, which entered half an inch below the centre of the lower edge of the right orbit, passed toward the centre of the head and lodged deep in the brain. On the following day the man was conveyed by steamer to the general hospital at Hilton Head. He became comatose on October 25th, and died on the following day. The case is reported by Assistant Surgeon John Bell, U. S. A.

Case.—Lieutenant Colonel Melanchthon Smith, 45th Illinois Volunteers, was wounded at the siege of Vicksburg, Mississippi, June 26th, 1863, by a buckshot, which fractured the cranium. The action of organic life seemed to be principally affected and circulation and respiration gradually failed together. He died on June 28th, 1863. The autopsy revealed a small penetrating wound of occipital bone. The missile comminuted the external table and diploë and turned aside an oval portion of the internal table, passed through the right lobe of cerebellum and lodged in the fold of the dura mater which separates that body from the right lobe of cerebrum. There was but little disorganization in the track of the ball and not much congestion of the meninges and cerebrum. The case is reported by Surgeon O. B. Ormsby, 45th Illinois Volunteers.

Case.—Colonel *Thomas Ruffin,* 1st North Carolina Cavalry, aged 37 years, was wounded at Bristow Station, Virginia, October 14th, 1863, by a conoidal ball, which struck the skull, near the junction of the coronal and sagittal sutures, and passed along the latter a distance of four inches, fracturing both tables. He was admitted to the 2d division hospital at Alexandria on the following day, being perfectly conscious. No paralysis existed and the pupils were normal. On the 17th there was slight delirium occurring at intervals. The bowels being constipated, half an ounce of castor oil was administered. He retained full possesion of his faculties until a minute before his death, which occurred suddenly on the 18th. On the removal of the skull-cap, it was found that the inner table was shattered for a space of one and a quarter inches in diameter; spiculæ being lodged in the membranes and driven into the substance of the brain. As this organ was taken from the cavity for special examination, two ounces of blood collected in the back of the skull; and two clots containing somewhat more than an ounce of fluid, with about three ounces of a sero-purulent character, were found lying upon the left anterior lobe, beneath the dura mater. A flattened piece of the missile was found in the right anterior lobe, on a level with the corpus callosum, directly beneath the wound of entrance. The pathological specimen is No. 1734, Sect. I, A. M. M. The fractured and depressed portion measures three-fourths by one inch. A fissure one inch in length runs downward in the centre of the frontal bone. The fragments removed consist entirely of diploë and inner table. The fragments of the outer table remain in situ. The specimen and history were contributed by Acting Assistant Surgeon T. H. Stillwell.

Case.—Corporal Lucian Sanderson, Independent Company, 9th Massachusetts Light Artillery, was wounded at the battle of North Anna, Virginia, May 23d, 1864, by a conoidal ball, which struck the left temporal bone immediately above the meatus auditorius externus and penetrated the brain. He was, on the same day, admitted to the hospital of the 4th division, Fifth Corps, in a comatose condition, with the brain substance oozing from the wound. Simple dressing was applied, but death supervened on May 24th, 1864.

Case.—Private Butler G. S———, Co. F, 9th Kentucky Cavalry, was wounded July 12th, 1863, Morgan's Raid, by three buckshot; the first entered at the external angle of the left eye, passed through the upper lid close to the superciliary ridge, penetrated the orbital plate of the frontal bone and lodged in the cerebrum; the second entered over the zygomatic process of the left side, and the third over the superior maxillary bone near the origin of the zygomaticus major muscle. He was admitted to the hospital at Madison, Indiana, July 12th, 1863. He remained unconscious for three days. On July 17th, his condition had improved, but on July 23d, inflammation of brain and coma followed. He died July 24th, 1863. The pathological specimen is No. 4568, Sect. I, A. M. M. It was contributed by Surgeon A. M. Wilder, U. S. V.

Case.—Private *H. Thompson,* Co. D, 16th Georgia Regiment, was wounded at the battle of Chancellorsville, May 3d, 1863, by a buckshot, which penetrated the left temple just above the zygomatic process, one inch posterior to outer portion of orbit. When admitted to the Chimborazo Hospital at Richmond, he complained of much pain in the vicinity of the wound, which was slightly tumefied and discharged a small quantity of healthy pus. The pulse was natural; there was no fever, and the bowels were moved once daily. Cold applications were regularly kept up until May 15th, when symptoms of oppression appeared. There was stertorous respiration, with pulse 70, the mind much confused; mouth and tongue quite dry, but no dilatation of pupils was noticed. The orifice of wound was enlarged to permit free exit of discharge; the head was shaved and ice freely applied to the scalp. From May 18th, the patient improved, and apparently recovered, but on May 30th, he became suddenly comatose, and died May 31st, 1863. At the autopsy, a buckshot, much flattened, was found imbedded a quarter of an inch in base of an anterior portion of the middle lobe of left hemisphere. The ball had passed through the wings of the sphenoid bone, and a considerable quantity of healthy looking pus flowed freely into the cavity of the cranium from the temporal fossa through the orifice. A complete sac had invested the ball, and also a small fragment of bone, which had been carried with it. There was very slight congestion of the pia mater and arachnoid.

Case.— ——— ———, was brought into the Prince Street Hospital, Alexandria, Virginia, May 14th, 1864, with a penetrating fracture of both tables of the left parietal bone at the anterior superior angle. He was comatose, passed urine involuntarily. He moved his arms freely; but the legs were motionless, the pupils dilated and fixed, and the right eyelid ecchymosed. A puffy swelling existed in the right temporal region. Convulsions supervened, and death ensued the same evening.

Case.—Private E. N. York, Co. E, 9th New York Heavy Artillery, aged 30 years, was wounded at the battle of Monocacy Junction, Maryland, July 9th, 1864, by a conoidal musket ball, which entered the occipital bone and lodged in the brain. He was sent to the Frederick Hospital on the evening of the same day. The brain exuded, but the patient could readily move about in his bed, and with assistance could sit up, being well able to converse. He continued in this state, with occasional severe headache, for five days; then stupor supervened, with strabismus, and the case terminated fatally on the 15th of July, 1864. The orifice made by the missile was a smooth round opening without depression of the surrounding bone. The case is reported by Acting Assistant Surgeon John H. Bartholf.

In the five following curious cases, the presence of balls within the cranial cavity was unsuspected during life:

Case.—Private Antoine Pascha, Co. F, 6th Vermont Volunteers, aged 21 years, received a gunshot wound in the head during the Peninsular campaign. No record of the case can be found until September 26th, 1862, when the patient was

admitted to Carver Hospital at Washington. On January 8th, 1863, he was sent to Baxter Hospital, Burlington, Vermont, and on April 7th to Fort Wood, New York Harbor. He had been treated for a wound received in another engagement, and had nearly recovered on May 6th, 1863, when an attack of encephalitis supervened, causing death on May 8th, 1863. The autopsy revealed a bullet in the brain, behind the frontal bone, near which a small abscess had formed. Surgeon John Campbell, U. S. A., reported the case.

Case.—Corporal G. W. S——, 12th Massachusetts Volunteers, aged twenty-nine years, was wounded at the battle of Fredericksburg, December 13th, 1862,and was admitted to Camden Street Hospital, Baltimore, six days subsequently. The humors of the right eye had been evacuated by a ball, which had likewise inflicted a slight wound of the lower lid. The left eye was observed to be unnaturally prominent, but its functions were undisturbed. The patient did not complain of pain or any inconvenience, except a slight headache. There were no cerebral symptoms, and no one suspected that the projectile had entered the brain. The functions of the left eye were in no way disordered, although it was observed that the globe was unnaturally prominent. Opiate lotions were applied to the right eye. There were no symptoms of importance except the comparatively slight local pain, and frontal headache. The wound healed kindly, and after three weeks the man walked about the city habitually, with a hospital pass. He appeared to be well, except that he had an occasional pain over the left eye, until February 6th, 1863, when he had a chill, followed by a febrile reaction. The fever assumed a continued form with occasional chilliness. No marked cerebral disorder supervened, however, until February 10th, when delirium was noticed at night. On the following day the patient was comatose, though intelligence was not entirely abolished. He would occasionally answer a question, or put out his tongue when ordered. The pupil of his remaining eye was greatly dilated. The sphincters were relaxed. Cupping and blistering were employed without benefit. The patient sank rapidly, and at midnight of February 15th, he died. The autopsy revealed a conoidal musket ball wedged between the sphenoid and the left orbital plate of the frontal bone, and lying in contact with the dura mater. On removing the calvaria, the pia mater was found much congested, and from the confluence of the longitudinal and lateral sinuses, or torcular herophili, a considerable quantity of dark fluid blood escaped. The ball depressed the thin inner wall of the left orbit, thus diminishing its capacity and forcing forward the eye. This fact explained its unnatural prominence observed during life. The missile had, after passing through the eye, entered the cranium through the third inner wall of the right orbit, at the junction of the sphenoid and ethmoid bones. The ball did not penetrate the dura mater, but remained in contact with and pressing against it. In consequence of this pressure, ulceration of that membrane resulted, and an abscess formed, extending from the point of contact to the left lateral ventricle, containing about two drachms of pus. A few drops of pus, apparently encysted by lymph, were discovered pressing directly against the commissure of the optic nerve, which was the probable cause of the extreme dilation of the pupil. The pons Varolii and the medulla oblongata, were found bathed in pus. The autopsy was made, and the specimen, which is represented in the accompanying wood-cuts, (Fig. 103, and Fig. 104,) was presented to the museum by Acting Assistant Surgeon George H. Dare, who also furnished the very interesting notes of the case.

Fig. 103.—Conoidal ball embedded between the sphenoid and frontal bones. *Spec.* 1108, A. M. M.

Fig. 104.—Exterior view of the foregoing specimen.

Case.—Sergeant J. R. B———, Co. A, 55th Virginia Regiment, aged 26 years, was wounded at Poplar Grove Church, Virginia, October 1st, 1864, by a conoidal ball, which entered just above the inner canthus of the left eye, fractured the frontal bone, passed backward and to the right, and lodged at the posterior angle of the right orbit. He was conveyed to the hospital of the first division, Fifth Corps, and on October 8th was sent to Lincoln Hospital, Washington. The right eye was inflamed, and had a bulging appearance. No bad symptoms occurred until October 26th, when the patient vomited. He became comatose and feverish on the evening of the 28th, and died on the following morning, October 29th, 1864. At the autopsy disorganization of the anterior lobe of the left hemisphere was found extending to the left lateral ventricle; both ventricles were filled with a purulent sanguineous fluid, and the base of brain was covered with pus. The pathological specimen is No. 3373, Sect. 1, A. M. M. A section of skull, showing fracture and comminution of the intraorbital septa, and of the right orbital plate of the frontal bone. The specimen and history were contributed by Acting Assistant Surgeon H. M. Dean.

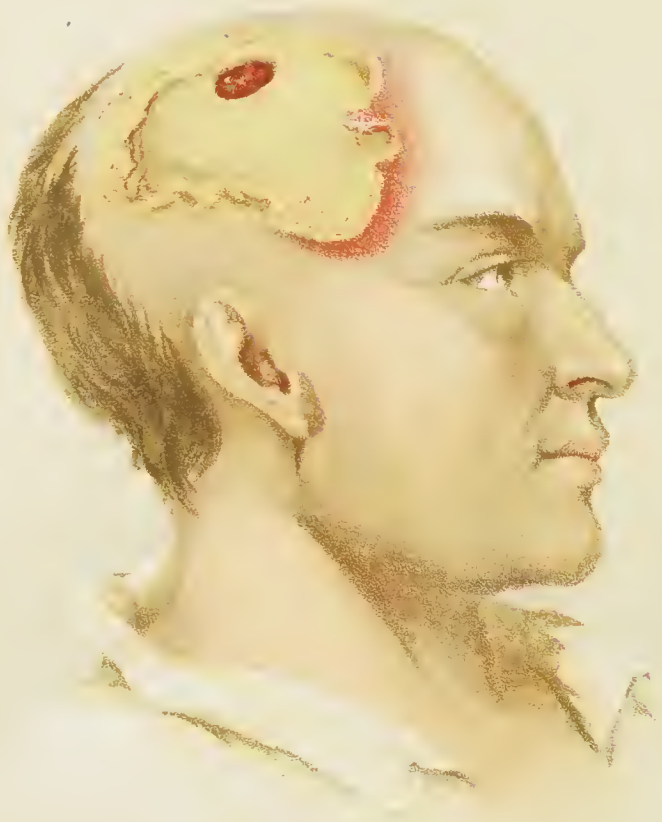
Case.—Private A. Van Walker, Co. A, 7th Wisconsin Volunteers, aged 20 years, was wounded at the battle of Gettysburg, July 1st, 1863, by a conoidal musket shot which perforated the frontal bone about half an inch above the right orbit and entered the brain. He was admitted to the Camp Letterman Hospital on the same day, where he remained until the 8th, when he was transferred to McKim's Mansion Hospital at Baltimore. Considerable inflammation existed in the region of the wound, which readily yielded to expectant treatment, which was continued until the 3d of September, when the patient complained of pain in his head, though apparently doing well. On the 12th, he walked two miles to witness a parade, without suffering any inconvenience from the exposure and exertion. On the 18th he was seized with violent pain in the head, which was attended with nausea and vomiting. Temporary relief was in a measure afforded by the use of opiates and counter-irritants; but coma ensued next day, and death resulted at midnight of the 20th. At the autopsy, the missile and a fragment of bone were found lodged in the anterior lobe of the cerebrum, on the right side of the sella Turcica. The anterior lobe of the right hemisphere was a disorganized mass. The case is reported by Acting Assistant Surgeon William G. Small. The ball, represented in the adjacent wood-cut, was forwarded to the Museum by Surgeon L. Quick, U. S. V.

Fig. 105.—A bullet which remained eighty-two days in the brain. *Spec.* 1027, Sect. I, A. M. M.

Case.—J. B. I——— was received on board the hospital steamer State of Maine from City Point, on April 5th, 1865, with a gunshot fracture of the frontal bone over the left eminence caused by a small iron canister shot. He died while on the way to Alexandria. At the autopsy a portion of the depressed bone and the missile were found imbedded in the anterior lobe, and pus existed under the pia mater on the frontal and parietal convolutions. The substance of brain was mostly of a dark slate color and was greatly softened. There were no special bloody effusions. The pathological specimen is No. 1497, Sect. I, A. M. M. The wound of the external table is one inch by one and three-fourths from which two-thirds of the substance have been removed, the remaining fragments being slightly depressed. The fracture and loss of substance of the inner table are somewhat greater and the borders are necrosed. The specimen, with the history, was contributed by Surgeon E. Bentley, U. S. V.

Perforating Gunshot Fractures of the Skull.—A few instances were reported in which men survived after perforations of the craniums by musket balls. The abstract of the following case furnishes an instructive example, the more interesting because the patient has been kept under observation for nearly nine years from the date of the reception of the injury:

Case.—Private Patrick Hughes, Co. K, 4th New York Volunteers, aged 23 years, was wounded at the battle of Antietam, September 17th, 1862, in Sumner's attack on the right, near Dunker's Chapel. Several special reports, at variance in regard to some particulars of the case, have been received. In the note book of Surgeon J. H. Brinton, U. S. V., it is stated that "two missiles had struck the back portion of his head, the one near vertex causing injury of greatest extent," and that "he did not entirely lose his consciousness at time of injury." But the field report, and the majority of the subsequent hospital reports, state very positively that the injury was a perforation of the skull by a single conoidal musket ball entering near the inner posterior angle of the right parietal, and emerging at a higher point of the left parietal, making, after traversing a portion of the brain, a large exit wound. Little is known of the early history of the case, except that the patient dragged himself from the field, and, after a preliminary dressing from Surgeon G. W. Lovejoy of his regiment, was conveyed to a field hospital in a barn near Keedysville, where he remained until the 20th, when he was sent to Hagerstown. The regimental surgeon reports that the shock and depression from the injury was great, but that the patient was conscious and answered questions rationally. There is no report from the Hagerstown hospital, except that the patient was sent to Washington on the 24th. On the 25th, he was received at the Mount Pleasant Hospital. The following is an extract from the report of Acting Assistant Surgeon Thomas Carroll, who had immediate charge of the case, after the patient's admission to Mount Pleasant Hospital: "The ball entered half an inch posterior to the junction of the coronal and sagittal sutures on the median line, passed backward under the scalp and escaped one inch above the occipital protuberance, inflicting a wound four inches in length, producing a compound comminuted fracture of the skull of the same extent. At the time of his admission to the hospital, eight days after the reception of the wound, so much tumefaction of the parts existed that it could not be ascertained whether or not the brain or its membranes were injured. The general condition of the patient was good; suppuration had commenced; no febrile action existed, the pulse was regular, sleep not materially disturbed, mind clear and manifesting no signs of compression of the brain, or inflammation of its membranes. Little, if any, change was perceptible for several days, when the swelling of the scalp and tissues subsided, leaving a prominence nearly, if not altogether, one inch in height, and two and a half or three inches in length of brain substance, in which the pulsation of the arteries could be distinctly observed. From the closest examination that could now be made, it was supposed that the membranes of the brain were not lacerated, though this supposition was by no means certain, as there was reason to believe the brain itself had been penetrated. The chief, and in fact, the only unpleasant symptom complained of by the patient, was an occasional paroxysm of giddiness that occurred at intervals of from ten to fifteen days; the paroxysms continued to return, though less frequently, while he remained in the hospital. Early in December, he was able to sit up and walk about the ward, and was never afterwards much confined to bed. The protuberance now began to subside, and was soon reduced nearly to a level with the skull; numerous pieces of bone were removed as they became detached from the tissues, leaving a complete channel in the cranium from the point where the ball entered to where it emerged. At the time this man was discharged from the service, January 26th, 1863, the wound was nearly healed. There was but little discharge of pus, and with the exception of an occasional recurrence of the paroxysms of giddiness, he suffered but slight inconvenience. The treatment consisted simply in cutting the hair short, and applying cold water dressing locally, paying strict attention to the diet, and administering a cathartic as often as symptoms seemed to indicate its use." Assistant Surgeon C. A. McCall, U. S. A., in charge of Mount Pleasant Hospital, furnished a report of the case, from which the following extracts are made. "The ball passed from about one inch above and to the right of occipital protuberance into the cavity of cranium and emerged at a point on the left of the median line, about one and three-fourths inches from the point of entry; probably a conoidal ball. From the posterior margin of the inferior wound to anterior margin of superior was about four inches. At the time of his admission to hospital, eight days after the injury, so much tumefaction and hardened clot existed, that it was deemed inadvisable to make a very strict examination with a view to determine the extent of lesion. The hair was closely shaved, and cold water dressings applied and patient placed in a sitting posture. The general condition of patient was promising, although all the brain functions appeared clouded, the memory impaired, speech desultory or given in fragments, yet being readily aroused and, generally at such times, answering promptly and clearly. In a short time healthy suppuration was established, febrile action decreased, the pulse became regular, sleep became natural, the mind began to show clearness, and he seemed to lose all symptoms of compression or of inflammation of the brain or its membranes. The swelling and induration of the parts gradually disappeared, leaving in their place a fungus cerebri of considerable size, perhaps an inch in height by two and a half or three inches in length, in which the pulsation could be distinctly seen and felt. The only unpleasant symptom now existing was the occurrence of a paroxysm of giddiness at intervals of ten or twelve days, which symptom continued, although at much greater intervals, during the remainder of his stay at the hospital. The size and extent of the fungus deterred me from using the knife, and I had resort to compression as recommended by the surgeons of France, but with such serious results that I was startled for the safety of my patient, and therefore threw aside all dressing save the simple cerate on soft lint,



GUNSHOT FRACTURES OF THE CRANIUM.

and proper guard for the delicate tissues. Early in December, he was able to sit up and walk about the wards, and was never afterwards confined to the bed. From this time the fungus commenced to decrease in size, and continued to do so until shortly before his discharge from the service, January 26th, 1863, when it had shrunk below the level of the skull, and both openings had been well covered by cicatricial tissue. During the progress of the case numerous spiculæ of bone were removed as they became detached. The constitutional treatment consisted in paying strict attention to the diet, and exhibiting saline cathartics and turpentine injections as the symptoms seemed to call for. When the soldier left my hands he complained of no inconvenience whatever with the exception of the occasional attack of giddiness, and the fact that he could not see a small object when placed in a position directly on a level and on a middle line between the eyes. Both which defects, I consider, will diminish with time until lost. Shortly before the patient's discharge from Mount Pleasant, an excellent picture of the aspect of the injury at that time was made in water color, under the direction of Surgeon J. H. Brinton, U. S. V., who was then in charge of the Division of Surgical Records of the Surgeon General's Office, and had secured the services of an artist, Mr. Stauch, whose admirable drawing and coloring have furnished some of the best illustrations of this book. The figure on the right of the chromo-lithograph opposite is a good copy of Mr. Stauch's water-color drawing. I take the following memorandum of the case from one of the memorandum books turned over to me by Dr. Brinton: "Gunshot wound of head: The picture of this case was taken at the Surgeon General's Office, whither the man came as an orderly, or on an errand. He was perfectly well. A small carnified cerebral hernia existed at the exit wound, which was healing rapidly. The ball went into cavity of the skull and emerged. No symptoms existed at all, when the patient's portrait was taken. The wound was then some three or four months old. The history of this case, which I took at the time, has been unfortunately mislaid." After this we have the history of the case taken up by the pension examining surgeons. The patient went to Newcastle, Delaware, and was pensioned at four dollars a month, until June, 1869, when his pension was increased to eight dollars a month. Dr. D. W. Maull reports, at this date, that there was a loss of substance of the skull two inches wide and three inches long, leaving a large depression, covered only by the integuments of the cranium. "Through this can be seen at all times the pulsations of the brain. About the cavity the bone is ridged by the union of the fractured margins. There is almost constant dull pain, some loss of hearing, and the sight of the right eye is impaired." Dr. Maull regarded the disability as total. Yet the man worked afterwards in an iron foundry as puddler. On December 20th, 1870, this patient was examined by Doctors William Thomson and W. W. Keen of Philadelphia, who have published an interesting account[1] of his condition at that time, with a photograph, of which a reduced copy is given in the annexed wood-cut, (FIG. 106.) I make the following quotations from this paper: "His memory is quite good, but by no means so good as before the injury. He is rather easily bothered and confused, and more irritable than formerly. The sight of his right eye, he thinks, is poor. Whisky affects him as usual. Sexual power undiminished. He has no paralysis. The wound of entrance * * is marked by a slight depression in the bone, the wound of exit by a hollow two and a half by two inches, and one inch deep. No bone has closed this opening, but the scalp and hair dip down into the hollow. The arterial pulsations are barely perceptible. When recumbent the hollow is gradually obliterated and replaced, in about one minute, by a rounded protuberance. To prevent pain during this change, he supports the parts with his hand. When he coughs, even with moderate force, the depressed scalp instantly hedges up in a cone, which nearly reaches the general level of the skull and obliterates the depression, and then as suddenly subsides." Drs. Keen and Thomson observe that "the complete recovery from paralysis, (as evinced by his subsequent severe labor,) and the almost entire restoration of his mental faculties, are remarkable, especially in view of the probable deep lesion of the brain, both by the primary injury and the subsequent fungus cerebri." They comment also upon "the rapid changes in the state of the cranial contents, due to any change of position, to coughing, etc., as evinced by the effacement of the depression at the wound of exit." The authors also regard the case as of value in throwing light upon the probable anatomy of the optic commissure. Their discussion on this point is given in a foot-note.[2]

FIG. 106.—Cicatrix of a gunshot perforation of the skull, eight years after the reception of the wound. [From a photograph.]

[1] *Photographic Review of Medicine and Surgery.* Vol. 1, No. 3, p. 26. Philadelphia, February, 1871. J. B. Lippincott & Co.

[2] "Wollaston, (Phil. Trans. 1824. p. 222,) reasoning from two attacks of transient hemiopsia, occurring in himself, and other cases in friends, appears to have been the first to point out the semi decussation of the optic nerves at the chiasm. Longet (Traité de Phys., 2d ed. ii, 476) seems to assent to the explanation, though he refers to cases of perfect sight in which it is asserted no chiasm existed; and in his Traité d'Anat. et de Phys. du Syst. Nerv., p. 666, he gives cases of perfect sight in both eyes, in spite of unilateral cerebral atrophy or traumatic lesion. Von Graefe (Archiv, ii, 286) assents cordially to Wollaston's view, admitting that he proposes nothing new, but that which is far too little known. Hubert Airy, (On a Distinct Form of Transient Hemiopsia, Proc. Roy. Soc., Feb. 17th, 1870, in "Nature," i, 444,) after a careful examination of preceding writers, also supports it; and the experiments of Laborde and Leven, (Med. Gaz., Nov. 5th, 1870; from Gaz. Méd. de Paris,) who found atrophy of the right optic nerve following the removal of the superficial right cerebral convolutions, and without any apparent irritative proeesses, would also point in the same direction. In our own case, the point to which we desire to call special attention is the rigid optical examination of the region between the porus opticus and the macula lutea. The semi-decussation of the nerves at the chiasm being admitted, it would naturally be supposed that the fibres *a* from the left tract would supply the left retina from the porus opticus toward *a'*; but our examination shows that it supplies *less* than this, viz.: only that part of the retina from *c* to *a'*; while in the right eye the fibres *b*, instead of supplying the retina from the porus opticus to *b'*, supply *more* than this, viz.: that part of the retina from *c'* to *b'*. In other words the fibres *a* and *b* of the left optic tract supply, mathematically, the left halves of the two retinæ from *c* to *a'* and *c'* to *b'*, and the right tract the right halves. As to the cerebral seat of the sense of vision, the amount and depth of the injury to the brain are too uncertain, perhaps, to warrant us in venturing on any speculations as to its locality."

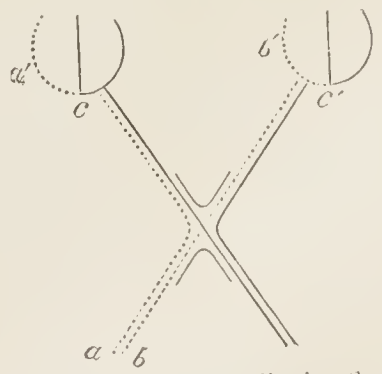


FIG. 107.—Diagram indicating the relations of the optic commissure and retinæ. [After Drs. Thomson and Keen.]

CASE.—Private Abraham D. Myers, Co. K, 4th New York Cavalry, aged 21 years, was wounded in an engagement near Charlestown, Virginia, August 28th, 1864, by a conoidal musket ball, which penetrated the frontal bone just above the right eye, and passing downward through the orbit emerged near the right ear. On the following day he was admitted to the general hospital at Sandy Hook, Maryland. On September 4th, he was sent to the Jarvis Hospital at Baltimore, and on the 12th, was transferred to the Mower Hospital, Philadelphia. The treatment seems to have been of a general character. He recovered, and on February 13th, 1865, was transferred to the Veteran Reserve Corps. This patient is not a pensioner.

In the following cases of perforation of the skull by musket balls, the patients survived, though totally and permanently disabled:

CASE.—Private Hugh Collins, Co. I, 26th New York Volunteers, was wounded at Antietam, September 17th, 1862, by a conoidal ball, which entered the cranium just above the right eye and lodged in the left side of the neck, four inches below the ear. The ball was removed, and the patient was admitted to the field hospital at Smoketown, Maryland, October 8th, 1862. On December 20th, he was discharged the service. On February 18th, 1863, he was examined for a pension by Pension Examiner H. B. Day. Partial amaurosis of both eyes existed, otherwise the man enjoyed good health. Subsequent information states that this man was unable to work, and that his sight was impaired. His disability is rated total and permanent.

CASE.—Private John H. Stallman, Co. A, 4th Pennsylvania Cavalry, aged 21 years, was admitted to the National Hospital at Baltimore, from Sandy Hook, Maryland, September 8th, 1864, having been wounded at Winchester, Virginia, July 24th, 1864, by a musket ball, which entered at the right temple and emerged at the opposite side of the head. When admitted he was stupid and almost comatose, in which condition he remained for several weeks. He finally recovered so far as to be fit for light duty, but being subsequently seized with a spasm was again placed under treatment. On December 10th, 1864, he was transferred to Cuyler Hospital, Philadelphia. On admission, the wounds were entirely healed; his bowels were constipated, and he suffered from almost constant nausea. His pulse was slow and feeble; tongue slightly coated with a whitish fur, the tip and edges remaining red; his pupils were equal and constantly dilated. He had no strabismus. He stated that he had purulent discharges from his right ear, attended with pain. His mental faculties were slow and uncertain and his memory impaired, but he had no hallucinations or mental aberrations. While in this hospital he had one slight spasm. On May 10th, 1865, he was transferred to the Mower Hospital, Philadelphia, whence he was discharged the service May 23d, 1865, and subsequently pensioned. On June 24th, 1865, Pension Examiner W. J. McKnight reports: "It is beyond my power to tell the extent of the injury. I only wonder that the boy lives." He rates his disability as total.

CASE.—Private William H. Haggart, Co. G, 92d Illinois Volunteers, aged 17 years, was wounded at Powder Springs, Georgia, October 3d, 1864, by a conoidal musket ball, which struck the left side of the head, and passing through carried away a large fragment of the left half of the occipital bone. He became insensible and lost more than an ounce of cerebrum, leaving bare the meningeal artery. For several weeks he was treated in the hospital at Marietta, and on November 10th, was sent, via Chattanooga, to Nashville, Tennessee, where he was admitted to Hospital No. 2, on November 12th. He was furloughed on November 16th, and afterward was admitted to the hospital at Mound City, Illinois. He was discharged on April 26th, 1865. The pupils of both eyes were dilated, causing dimness of vision, so that he could only read very coarse print. The case is reported by Acting Assistant Surgeon J. K. Fay. A communication from the Commissioner of Pensions dated January 21st, 1870, states that the man was a pensioner until November 19th, 1868, when he died.

CASE.—Private Joshua F. Lock, Co. E, 15th Iowa Volunteers, aged 21 years, was wounded near Atlanta, Georgia, August 11th, 1864, by a conoidal musket ball, which caused a perforating fracture of the base of the cranium. On the same day he was admitted to the hospital of the 4th division, Seventeenth Corps; on the 14th, was sent to the Seventeenth Corps hospital, and on September 20th, 1864, was furloughed. On November 22d, he was admitted to the hospital at Keokuk, Iowa. Simple dressings only were applied to the wound. He was discharged the service August 25th, 1865, and pensioned. On August 28th, 1865, Pension Examiner H. F. Cleaver states that there was partial hemiplegia of the right side, and rates the disability total.

CASE.—Sergeant James M. Woodman, Troop E, 1st District of Columbia Cavalry, was wounded in the engagement at Weldon Railroad, Virginia, August 23d, 1864, by a gunshot missile, which entered just above the left frontal eminence and emerged at a point one inch behind the upper margin of the right ear. He was unconscious for several hours, and for three months was delirious during the night. He was examined on February 2d, 1865, by Pension Examiner R. K. Jones. At the wound of entrance was a cutaneous scar, but the bone was not depressed. At the wound of exit, eight small fragments of bone had been discharged, leaving a depression one-third to one-half inch deep. Both scars, especially the latter, were sensitive to pressure. The organs of special sense and the intellect were unimpaired. At night, and when he stooped or was exposed to heat, he had pain in his head. He was discharged the service August 10th, 1865, and pensioned. On August 7th, 1867, Pension Examiner John Benson reported that small portions of bone had exfoliated. The patient suffered considerably from dizziness and sharp pains in the head and was unable to perform much labor. He had been subject to great suffering and pain ever since he was wounded. His disability is rated total and permanent.

CASE.—Private *Charles C. Trotman*, Co. H, 9th Mississippi Infantry, aged 17 years, was wounded at the siege of Atlanta, Georgia, August 30th, 1864, by a ball, which entered the forehead just above the left eye, and emerged behind the right ear. He was retired by an examining board on January 3d, 1865. The vision of both eyes was affected, and he was permanently disabled.

CASE.—Lieutenant *W. H. Coward*, Co. F, 7th Arkansas Regiment, aged 22 years, was wounded in an engagement at Jonesboro', Georgia, September 1st, 1864, by a conoidal musket ball, which entered the cranium one inch above the mastoid process and presented itself on the opposite side, where the cerebral matter left no doubt as to the fact that the brain was injured.

On the following day, he was admitted to the hospital of the 2d division, Fourteenth Corps, being perfectly unconscious, with stertorous breathing. Toward evening, he became conscious and restless, complaining of loss of vision and inability to raise his head. Toward midnight he commenced to scream, and for three weeks did so incessantly, even during his moments of sleep. On September 20th, he suddenly became composed and quiet, and answered questions coherently. The left side for some days seemed paralyzed, as he could not use his hand or leg. The face was drawn to the right, and he seemed to have some difficulty in swallowing; his secretions were natural, and he had constant priapism, with seminal emissions. All these symptoms, however, became gradually better; but as soon as he became able to move about, he seemed unable to guide his movements, and the power of will over motion seemed lost. But he rapidly improved. During the progress of healing, several spiculæ of bone came away. About the seventh week all discharge from the wound had ceased. The patient was transferred to Nashville on October 30th, 1864. The pupil of the left eye seemed permanently dilated and intolerant of light. On December 8th, 1864, he was sent to the Provost Marshal for exchange. The case is reported by Surgeon Edward Batwell, 14th Michigan Volunteers.

Case.—Private Eugene Plumly, Co. L, 8th New York Heavy Artillery, aged 23 years, was wounded at Petersburg, Virginia, June 16th, 1864, by a conoidal musket ball, which entered at the inner angle of the left eye, passed through the brain substance and emerged behind the left ear. He was admitted, on the same day, to the Second Corps hospital, and thence was conveyed to the Lovell Hospital in Rhode Island, where he arrived on June 26th. He remained under treatment at Portsmouth Grove until the 22d of August, when he was transferred to the Ira Harris Hospital, Albany, New York, the wound being still open. The treatment consisted chiefly in the dressings of the wound, which had cicatrized by the 22d of December. His general health being good at that date, he was discharged the service and pensioned, the vision of the left eye being obscured. On March 7th, 1867, Pension Examiner John Post reported that there was a discharge of pus from the orifice of entrance of the ball and through the right nostril and upper part of the posterior nasal cavity into the mouth. There was constant headache; he could not stoop without becoming dizzy, and his eye-sight was imperfect. At night, pus ran into his mouth so that he was often obliged to rise and cleanse his throat in order to sleep. His disability is rated total and permanent.

Case.—Private James R. Gailey, Co. F, 67th Pennsylvania Volunteers, aged 37 years, was wounded in an engagement at Sailors' Creek, Virginia, April 6th, 1865, by a conoidal ball, which entered the left external ear and mastoid process of the temporal bone, passed obliquely through the left lobe of the cerebrum and emerged at the centre of the occiput. He was admitted to the hospital of the 1st division, Sixth Corps, on the same day; thence was sent, via City Point, to the Carver Hospital, Washington, which he entered May 14th, 1865. Simple dressings only were applied to the wound. He was discharged from service on July 15th, 1865, with total deafness of the left ear, and was pensioned, his disability being rated total and temporary.

Case.—Private Samuel P. Starrett, Co. I, 1st Michigan Volunteers, was shot through the head at Gaines's Mills, Virginia, June 27th, 1862. The missile passed from temple to temple, causing the loss of both eyes. He was taken on board the Steamer Vanderbilt, and on June 24th, was admitted to DeCamp Hospital, New York Harbor, where he was discharged the service on September 29th, 1862, and pensioned, his disability being rated total.

Case.—Private Robert Elliott, Co. E, 119th Pennsylvania Volunteers, aged 39 years, was wounded at the battle of Wilderness, Virginia, May 6th, 1864, by a conoidal ball, which entered at the occipital bone and escaped under the right eye. He was immediately admitted to the 1st division, Sixth Corps, hospital, and on May 27th, was conveyed to the 2d division hospital, Alexandria, Virginia. On June 20th, he was transferred to the hospital at Chester, Pennsylvania. Partial paralysis of the lower extremities had occurred. On March 20th, 1865, he was sent to the Turner's Lane Hospital, Philadelphia, and was discharged from service on August 29th, and pensioned. On September 11th, 1866, Pension Examiner M. G. Emanuel reported that his disability then consisted in partial paralysis of both lower extremities, imperfect vision, disturbance of the mental faculties, and severe pain in the head. In 1867, his disability was rated total and permanent.

Case.—Private Samuel Caldwell, Co. H, 16th United States Infantry, was wounded at the battle of Stone River, Tennessee, January 3d, 1863, by a round musket ball, which entered the skull about the middle of the left temporal fossa and emerged at precisely the same point on the opposite side. After remaining on the field forty-eight hours, he was removed to a field hospital. Inflammation extended over the entire upper part of his face, his eyes being closed and exceedingly painful; the head and face were much swollen. Under simple antiphlogistic treatment the case rapidly improved. By the 13th, all violent pain and inflammation had subsided. Several spiculæ of bone were removed, and all accessible sharp points of the fractured skull were broken off. About this time, the patient averred that he could discern light with one of his eyes. The wounds closed with healthy granulation, and the case was progressing finely on the 17th, when he was sent to Hospital No. 12, Nashville, Tennessee. He was discharged the service March 14th, 1863, by reason of total blindness, and was pensioned, his disability being rated total and permanent. The case is reported by Surgeon John M. Todd, 65th Ohio Volunteers.

In the foregoing fourteen cases, in which the patients survived gunshot perforations of the cranium, the disabilities resulting were regarded by the pension examining surgeons as total and permanent; "total," in the classification of the Pension Bureau, implying incapacity to earn a livelihood by either physical or mental exertion. Vision was destroyed in two instances, and more or less impaired in seven others. Complete deafness resulted in one case; hemiplegia in one case, paraplegia in another, and local paralysis in three others; and nearly all of the patients suffered from vertigo, headache, defective memory, and various forms of impairment of the mental faculties. The reports are not

sufficiently detailed to permit a more minute analysis of the results of the extended lesions of the brain which co-existed with the fractures in this series of cases.

The reports of a few of the fatal cases of perforating fractures embrace some particulars of interest. The following nine patients were under treatment for periods varying from two hours to four months:

CASE—Sergeant L. O. Blanding, U. S. Signal Corps, aged 35 years, was wounded in action near Nashville, Tennessee, April 14th, 1862, by a musket ball, which entered near the centre of the left superciliary ridge and emerged just outside of the external angular process of the frontal bone. Only little hæmorrhage occurred, but he immediately became insensible, and was conveyed to Hospital No. 9 at Nashville. An exploration of the wound revealed a comminution of the superciliary ridge and of the orbital plate. About a teaspoonful of cerebral matter had been scooped out by the missile. The patient never reacted; he remained in a comatose condition until his death, April 16th, 1862, forty-eight hours after the reception of the injury. The history of the case was contributed by Surgeon Eben Swift, U. S. A.

CASE.—Private John Nulty, Co. C, 28th Massachusetts Volunteers, aged 23 years, was wounded at the battle of Antietam, Maryland, September 17th, 1862, by a conoidal musket ball, which entered the right zygomatic region anterior to the meatus auditorius, passed through the internal ear and mastoid process of the temporal bone, and emerged two and a half inches directly behind the meatus. He was admitted to the Locust Spring Hospital, where, in the course of treatment, two small pieces of bone were discharged from the meatus and one from the anterior wound. The wound of exit had nearly healed at the time of his transfer to Camp B Hospital at Frederick, Maryland, December 5th, 1862, but the anterior wound was discharging somewhat. The power of hearing in the right ear was destroyed, and the patient's vision was impaired. After his removal to Frederick he failed gradually, and died on January 20th, 1863. The case is reported by Surgeon T. H. Squire, 89th New York Volunteers.

CASE.—Private *A. J. Frazier*, Co. D, 3d Arkansas Regiment, was wounded in an engagement on the Williamsburg Road, Virginia, October 27th, 1864, by a conoidal musket ball, which entered one inch to the right of the occipital protuberance, passed laterally and a little downward, and emerged one inch to the left of the occipital protuberance. On October 29th, he was admitted, in an insensible condition, to the Receiving and Wayside Hospital at Richmond, where cold-water dressings were applied. On October 30th, the patient had somewhat rallied; he could hear and open his eyes, but could not see; could speak, but not remember, and complained of pain. October 31st, could hear, smell, taste, and feel; urinated freely, but his bowels were constipated. On November 7th, he regained his eyesight. On the following day, chills followed by fever supervened, leaving the patient again blind. On the 10th, another chill occurred; on the 11th, profuse discharge of bloody mucus from the wound took place, and death occurred on the same day.

CASE.—Sergeant *M. V. Temples*, Co. A, 2d Arkansas Regiment, aged 24 years, was wounded at Rocky Face Ridge, Georgia, May 8th, 1864, by a conoidal ball, which entered just in front of the left ear, passed upward and forward and emerged just above the right eye. On the next day, he was admitted to the Institute Hospital at Atlanta. He was perfectly rational, with no constitutional disturbance, could see but little with the right eye, and said that the vision of the left was lost from the time of the reception of the injury. On May 11th, his mind was wandering, but on the 16th, he was again rational, with some appetite. From the 18th to the 26th, he was unconscious, but seemed, at times, to understand when spoken to very loudly. He was feeble and emaciated and discharged fæces involuntarily; the wound suppurated freely. He died on June 8th, of asthenia. The case is reported by Surgeon D. C. O'Keefe, P. A. C. S.

CASE.—Private Henry E. H. P———, Troop K, 5th Iowa Cavalry, was wounded at Wartrace, Tennessee, October 6th, 1863, by a conoidal ball, which entered the centre of the *os frontis* and passed out at the squamous portion of the left temporal bone. Upon admission into the general hospital at Tullahoma, October 6th, lacerated brain protruded from both wounds; the patient was insensible and there was complete hemiplegia of the right side. He remained unconscious and died at four o'clock P. M., on October 9th, 1863. The pathological specimen is No. 2075, Sect. I, A. M. M. The fractured surface measures four inches in diameter, involving the anterior inferior angle of the parietal and adjoining portions of the frontal bone. The aperture of entrance is hardly larger than the point of the missile, which had acted like a wedge, splitting the bone in every direction; one of the fissures extending across the vertex; that of exit was, at least, an inch in diameter, and from this a fissure extended two inches into the right parietal, through both tables. On removing the skull-cap, large coagulæ were observed lining the dura mater, and the membranes of the brain and medulla were deeply congested. The specimen and history were contributed by Surgeon B. Woodward, 22d Illinois Volunteers.

CASE.—Private *J. E. Riggins*, Co. A, 43d Alabama, aged 36 years, was wounded at Spottsylvania Court-house, May 16th, 1864, by a conoidal musket ball, which entered at the middle of the frontal bone, penetrated and emerged at the middle of the left temporal bone. He was conveyed to Richmond and was admitted to Chimborazo Hospital No. 4. For two days he was comatose. On May 19th, his intellect became clearer, but he did not speak, and expressed himself by signs. He had the use of his limbs to a considerable extent. On May 20th, he lay in a state of semi-torpor, and from the wound in the forehead a sero-purulent discharge was expelled at each pulsation of the brain. Pulse 75 and natural. There was partial paralysis of the nerves supplying the organs of speech, causing a slight defect of utterance. The right eye was considerably ecchymosed. On the 23d, the pulse was 96 and weak; the patient continued to sink, and died on May 31st, 1864. The case is taken from the Confederate Hospital Records.

CASE.—Corporal Alexander French, Co. K, 3d Michigan Volunteers, was wounded at the battle of Mine Run, Virginia, November 27th, 1863, by a conoidal ball, which passed laterally from right to left through the occipital bone, traversing the substance of the brain four inches, and making its exit at a point directly opposite the wound of entrance. He was sent to the regimental hospital, and on December 4th, was transferred to the 2d division hospital, Alexandria, Virginia. Simple dressings were applied. The case terminated fatally on December 5th, 1863. The case was reported by Assistant Surgeon W. B. Morrison, 3d Michigan Volunteers.

CASE.—Lieutenant *H. W. F*———, Co. E, 23d North Carolina Regiment, aged 28 years, was wounded at the battle of Winchester, Virginia, July 20th, 1864, by a conoidal musket ball, which entered at the middle of the inferior border of the right parietal bone and passed out just behind its posterior inferior angle, leaving a bridge of bone one inch and three-fourths wide, and lodged beneath the integuments over the occipital protuberance. On July 23d, he was admitted to the hospital at Cumberland, Maryland, where the ball was removed, and simple dressings were applied. A tumor appearing near the place whence the missile had been extracted was opened, and discharged about two ounces of pus. Death resulted on July 30th, 1864. At the autopsy, upon dissecting back the integuments, a large portion of the skull, already detached, fell out. Suppuration had broken down the substance of the middle and posterior lobes of the brain, and the remainder, with the meninges, were turgid and congested. The pathological specimen is No. 4257, Sect. I, A. M. M. The fractured surface measures posteriorly two by three inches, the greater portion of the fragments being in situ. There are two short fissures of the parietal and one of the occipital bone. The specimen and history were contributed by Surgeon J. B. Lewis, U. S. V.

CASE.—Private *E. Radcliffe*, Troop E, 1st Maryland Cavalry, was wounded by a pistol ball, which entered the centre of the parietal bone, and passing through the substance of the brain, emerged near the centre of the left lambdoid suture. Upon admission to the Receiving and Wayside Hospital at Richmond, on March 9th, cerebral matter protruded from both wounds, the pulsations of the brain were very distinct, there was hemiplegia of the right side of the body, and the power of speech was lost; notwithstanding these symptoms his intellect was perfectly clear, appetite good, and bowels regular. The treatment consisted in the constant application of tepid water to the wound, a light stimulating diet, and as perfect quiet as possible. Erysipelas of the face having occurred, was speedily relieved by the local application of iodine. By May 1st, the general condition of the patient had improved, and the hemiplegia had gradually diminished. He was able to move the limbs and speak quite distinctly. The wound of entrance had entirely healed, and the wound of exit nearly so, only a small granulating surface remaining. On May 10th, he complained of sickness, vomited a greenish matter, and symptoms of tetanus presented themselves. Brandy, quinine, and morphia were freely given, and the symptoms somewhat abated. On the following day spasms occurred and an abscess opened on the edge of the wound. The tetanic symptoms continued, and death occurred on May 12th, 1864. The case is reported by Assistant Surgeon C. W. Brock, P. A. C. S.

In forty-five other cases of perforating gunshot fractures of the cranium, in which the patients survived long enough to be placed in hospitals for treatment; in which also, the positions of the entrance and exit wounds were noted, and indisputable proof that the missiles had traversed some portion of the brain tissue was adduced; in which, likewise, the dates of injury and of death were recorded, four patients survived after admission to hospital from one to twelve hours only; nine lived about twenty-four hours; six, about two days; eight lived three days; four, four days; two, five days; two, six days; three died on the seventh, eighth, and ninth days, respectively, and two on the eleventh day; one died on the thirteenth, one on the fourteenth, and two on the fifteenth days; while one survived a perforation of both parietals and both cerebral hemispheres for forty days. In one instance the ball opened the longitudinal sinus, and in another, and perhaps three others, passed through the cerebellum. It is to be regretted that in the latter cases the symptoms were not recorded more fully. The facts compiled from the hospital registers, case-books, and quarterly reports in the last three cases are as follows:

CASE.—Private Zimri B. Hiatt, Co. K, 3d Iowa Cavalry, received, in an engagement at Little Rock, Arkansas, April 25th, 1864, a wound of the skull by a conoidal musket ball. One account states that the wound was accidental. The missile entered to the left and a little in advance of the occipital protuberance and passed inward and downward, penetrating the cerebellum and making its exit through the right portion of the occipital, without injuring the lateral sinus. After treatment at a field hospital, the patient was admitted, on May 1st, 1864, to the general hospital at Little Rock. He was comatose and died a few hours after his admission. The case is recorded by Surgeon E. A. Clark, 8th Missouri Cavalry.

CASE.—Corporal Daniel Tippin, Co. H, 57th Ohio Volunteers, received, near Kenesaw Mountain, Georgia, June 27th, 1864, a gunshot fracture of the cranium. The missile, a musket ball, penetrated from one lateral angle of the occipital bone to the other, passing through the brain. The patient was conveyed to the hospital of the Fifteenth Corps, in a comatose condition, and died July 2d, 1864. These facts are recorded by Surgeon A. Goslin, 48th Illinois Volunteers. The regimental surgeon, Dr. Asa C. Messenger, only reports the case on the corps casualty list.

Case.—Corporal William Shaddock, Co. C, 3d Massachusetts Artillery, aged 21 years, was wounded near Petersburg, Virginia, June 20th, 1864, by a conoidal ball, which entered the mastoid process of the temporal bone, and passed upward and backward through the occipital protuberance, just above the torcular Herophili. In its course it opened the superior longitudinal sinus. The patient was, on the same day, admitted to the field hospital of the Fifth Corps in a comatose condition. He had lost much blood, and died eight hours after admission.

In a case,[1] reported by Surgeon A. M. Wilder, U. S. V., a conoidal musket ball entered at the glabella and passed through the brain substance and emerged at the occipital protuberance, a linear fissure of the vault, over seven inches in length, connecting the apertures of entrance and exit.

In another case,[2] reported by Surgeon G. A. Otis, 27th Massachusetts Volunteers, the patient, whose skull had been traversed by a conoidal musket ball which entered at the middle of the forehead and emerged at the junction of the inferior curved lines and crest of the occipital, survived three days, cerebral matter and grumous blood issuing freely from the exit wound. The patient was apparently conscious, and indicated his recognition of his friends by plaintive gestures. He was unable to articulate, but took food and drink without difficulty. On the second day, at intervals of one or two hours, he would throw his arms and legs about wildly, and it became necessary to secure his lower limbs to prevent injury to the amputated men who lay beside him on the floor of the field hospital. On the third day, he occasionally uttered piercing shrieks, and tossed about in great distress, and then would follow a comparatively lucid interval, when he was apparently conscious, and would recognize those about him and take nourishment, and attend decorously to the wants of nature. Later in the day, he gradually became comatose, and died sixty-two hours after the reception of the injury. It was inferred, from the direction of the track of the ball and from the disorderly movements of the limbs, that the cerebellum was injured. The exigencies of the occasion forbade an autopsy.

Crash or Smash.—The depressed fractures of the skull produced by cannon balls or by the explosion of large shells, were commonly attended by frightful comminution and disjunction of the sutures, and were almost always immediately fatal, and hence had little surgical interest. Yet, in a few instances, patients survived these dreadful injuries for several days, even when the brain substance had been lacerated or torn away. It was observed also that musket balls, and even carbine and pistol balls, fired at very short range, would cause as great destruction of the walls of the cranium as was produced generally by the larger projectiles:

Case.—Private Owen Owens, Co. C, 3d New York Artillery, was wounded accidentally on January 9th, 1865, by a fragment of shell, which fractured and depressed the left temporal and parietal bones. He was, on the same day, admitted to the Foster Hospital, New Berne, North Carolina. Simple dressings were applied, and stimulants were employed. The patient lay in a comatose state, quite unconscious of the terrible nature of his injury, or of surrounding objects, for three days. The usual symptoms of compression of the brain were present. The patient died on January 12th, 1865. Surgeon C. A. Cowgill, U. S. V., reports the case.

Some patients not only survived, for a short time, these severe injuries of the head, but were conscious and rational for a while:

Case.—Private William Kay, Co. F, 7th Connecticut Volunteers, was wounded at the battle of Pocotaligo, South Carolina, October 22d, 1862, by a grapeshot, which fractured the parietal bone near its union with the frontal and temporal bones, passed downward, fractured the temporal, malar, and superior maxillary bones, and lodged. On the following day he was admitted to the hospital at Hilton Head. Although in a stupor, he could be aroused without difficulty, and would then indicate, by the

[1] Case of Private R. A. Fisk, Co. E, 21st Massachusetts, Knoxville, November 24th, 1863. Died November 27th, 1863.
[2] Case of Private Samuel A. Dunning, Co. A, 27th Massachusetts, New Berne, March 14th, 1862. Died March 17th, 1862.

clearness of his right eye, a perception of external impressions. The left eye was closed by extensive tumefaction. Below the inferior maxilla a large protuberance was found which contained the missile. Acting Assistant Surgeon Thomas T. Smiley made an incision and extracted the same. It proved to be an iron ball fully an inch in diameter and weighing nearly four ounces. The patient died October 24th, 1862, fifteen hours after the operation. There was diastasis of the squamous and coronal sutures, with much comminution of the left parietal and temporal. Acting Assistant Surgeon Thomas T. Smiley reports the case.

CASE.—Private Clark D———, Co. G, 24th Michigan Volunteers, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a fragment of shell which carried away a large portion of the right temporal and frontal bones. He was taken to the hospital of the First Corps at Belle Plain, where he remained in a gently comatose condition, taking fluid nourishment when administered. Occasionally he had spasms or convulsions, though not of a violent nature. The wound of the scalp was huge, extending nearly to the vertex. A piece of bone about the size of a hen's egg was gone from the anterior portion of the wound. On the morning of December 19th, healthy granulations were observed rising from the wounded cerebrum; but during the day hæmorrhage took place from the middle meningeal artery, or some of its branches, and death occurred shortly afterward. At the autopsy it was found that an opening extended from the right frontal eminence to the mastoid portion of the right temporal bone, being five inches long and one and a half inches wide. From the anterior extremity of this, a fracture traversed the frontal bone to the middle of the left branch of the coronal suture, while from the posterior portion a second fissure traversed the right parietal to the centre of the occipital bone. Lines of fractures traversed the right supra-orbital arch, the nasal process of the right superior maxillary, and the base of the mastoid process of the right temporal. The pathological specimen is quite accurately figured in the accompanying wood-cut, (FIG. 108.) It was contributed, with the history of the case, by Surgeon J. H. Beach, 24th Michigan Volunteers.

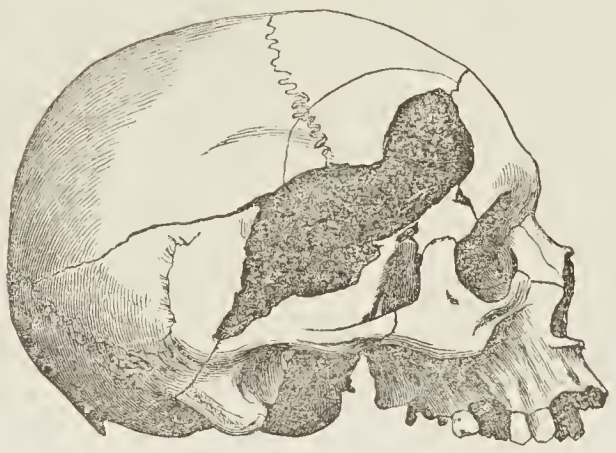


FIG. 108.—Cranium fractured by a fragment of shell. *Spec.* 831, Sect. I, A. M. M.

The next case furnishes the best example contained in the Army Medical Museum of diastasis of the cranial bones from external violence. Almost every suture is widely separated:

CASE.—X———, an unknown Confederate, was brought into Lincoln Hospital on July 17th, 1864, in an ambulance train conveying the wounded, abandoned by General Early, in front of Fort Stevens. According to the official reports, the Confederates retired from before Washington on the night of July 12th. The stretcher-bearers reported that this man was found nearly three miles north of Fort Stevens, unconscious and unable to articulate, with a terrible wound over the vertex, and that near by him was the huge fragment of shell supposed to have inflicted the injury, and to have been fired from one of the eleven-inch guns at Fort Stevens. It appears almost incredible that the patient could have survived so long. He died two hours after his admission to hospital. On the following day an autopsy was made. Over the anterior superior angle of the left parietal bone there was an extended scalp wound. On reflecting the scalp, multiple depressed fractures of the vault of the cranium came into view. The point of greatest depression is an inch to the left of the median line, near the coronal suture. The depressed fragments measure from before backward two inches, and from right to left three inches, and involve both parietals and the *os frontis*. A fissure runs through the squamous portion of the left temporal, and all the sutures of this bone are separated. The autopsy was made and the specimen was forwarded by Acting Assistant Surgeon Henry M. Dean. It is figured in the adjacent wood-cut, and much better in the Surgical Photograph Series[1] of the Army Medical Museum.

FIG. 109.—Cranium fractured by a large fragment of shell. *Spec.* 2871, Sect. I, A. M. M.

A yet more remarkable case is reported from Lincoln Hospital. The patient survived a fortnight:

CASE.—Private William W. Howell, Co. G, 11th Pennsylvania Reserves, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a shell, which fractured and tore away nearly all of the left parietal bone. Though in a state of stupor, he was able to swallow food and stimulants. He was treated at a field hospital for nine days, and then was conveyed, on a hospital transport steamer, to Washington, and admitted to Lincoln Hospital on December 23d, at which time about one-third of the left cerebral hemisphere had sloughed. Nearly all the brain sloughed away before his death, which occurred on December 26th, 1862. Surgeon Henry Bryant, U. S. V., recorded the case.

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[1] *Photographs of Surgical Cases and Specimens.* Prepared, by direction of the Surgeon General, by Brevet Lieutenant Colonel George A. Otis, Assistant Surgeon, U. S. A. Washington, 1866. 5 Vols., Quarto, Vol. I, Case 3.

The specimen represented in the subjoined wood-cut, (Fig. 110,) is from a soldier who survived his injury for a few hours only, and who was left on the battle field:

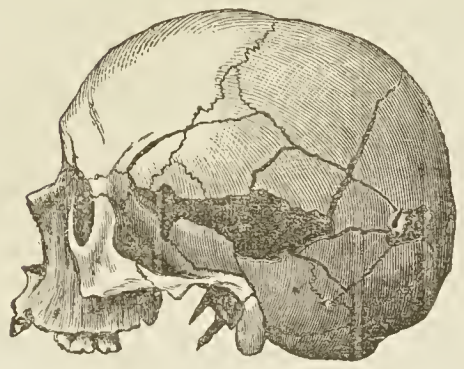

Fig. 110.—Skull, exhibiting an extensive fracture by grapeshot. *Spec.* 1318, Sect. I, A. M. M.

Case.—A soldier of General Longstreet's Corps was killed in a charge upon one of the Union batteries, in the second battle of Manassas, August 29th, 1862, by a grapeshot, at short range. The cranium was picked up, a year subsequently, by Surgeon F. Wolfe, 39th New York Volunteers, under an abatis near the stone bridge over Bull Run. The missile entered the left parietal near the lambdoidal suture, and made its exit through the squamous portion of the temporal. It is erroneously stated in the *Catalogue of the Surgical Section of the Army Medical Museum* (p. 30), that the fracture was inflicted, "probably, by a musket ball." The probabilities are that the missile was a grapeshot, as suggested by the collector, who had good reasons, apart from the appearance of the injured skull, for his opinion. It has been supposed that this skull presented an example of fracture by *contre-coup*, a subject to be discussed hereafter. There are, undoubtedly, fissures of the great wing of the sphenoid, and of the frontal, before and behind the right external angular process of the frontal—fissures unconnected with the lesions on the left side of the skull; and the right orbital plate is slightly depressed and a fissure extends through the right upper maxillary bone. Unless these fractures were produced *post mortem*, they must be regarded as fractures by *contre-coup*.

The next case illustrates the great extent of fractures of the cranium that may be produced by small projectiles. The Army Medical Museum possesses many examples of such multiple comminuted gunshot fractures; but they have been collected since the close of the War:

Case.—Private Thomas Dikes, Co. F, 12th Missouri Cavalry, was wounded accidentally on October 20th, 1863, by a large pistol ball, which shattered and carried away a part of the frontal and nearly the entire right parietal bones, and also lacerated and dashed out nearly one-third of the entire cerebral mass. He was immediately conveyed to the hospital at St. Joseph, Missouri. He was speechless and comatose. Death resulted in nine hours and some minutes after the reception of the injury. Assistant Surgeon Wesley Jones, 12th Missouri Cavalry, reports the case.

It would be easy, but of doubtful utility, to adduce other instances of obviously fatal comminution of the cranium by gunshot projectiles. One or two more examples will suffice, and the reader may be referred to the collections in the Army Medical Museum, where the subject is fully illustrated:[1]

Case.—Private Joseph B———, Co. D, 17th Massachusetts Volunteers, was wounded near New Berne, North Carolina, September 1st, 1862, by a fragment of shell which entered about the centre of the frontal bone, passed around the left side of the head, and emerged near the temporo-frontal suture. He was admitted to the Douglas Hospital, Washington, on September 5th, 1862, being partially conscious, with the right eye closed and greatly swollen. The skull between the two apertures felt soft. On September 10th, an abscess over the right eye opened about the middle of the upper lid, and pus and a few fragments of bone were freely discharged. On September 13th, the patient became comatose, and died on September 16th, 1862. At the autopsy, a large abscess was found in the anterior lobe of the left hemisphere. The pathological specimens are Nos. 236 and 514. The former shows a section of the cranium with an extensive comminuted fracture of the frontal bone a little to the left of the median line; the latter a wet preparation of the encephalon, with perforation of the dura mater, and abscess in the upper part of the anterior lobe of the left half of the cerebrum. The specimens were contributed by Assistant Surgeons W. Webster and J. W. Williams, U. S. A., respectively. The calvaria is represented in the wood-cut, (Fig. 111.) It is very thin.

Fig. 111.—Fracture of the frontal bone by a shell fragment. *Spec.* 236, Sect. I, A. M. M.

In the Confederate hospital records, an instance is found of a patient who survived a terrible depressed fracture of the skull for a fortnight, although there was the complication of erysipelas of the scalp:

Case.—Private *J. A. Hewlett*, Co. A, 1st North Carolina Volunteers, on May 11th, 1863, was admitted to Howard Grove Hospital, Richmond, Virginia. He had received, at the battle of Chancellorsville, May 3d, a shell wound of the left side of the head, shattering and depressing the parietal very extensively, and badly lacerating the scalp. The patient was in a state of stupor, with muttering delirium, and erysipelas had invaded the scalp. The erysipelatous inflammation extended, yet the unfortunate patient lingered until May 17th, 1863. Surgeon C. D. Rice, P. A. C. S., recorded the case.

[1] See, among others, specimens 1167, 860, 1166, 1319, Sect. I, A. M. M.

REMOVAL OF FRAGMENTS AFTER GUNSHOT FRACTURES OF THE SKULL.—Many instances of exfoliation and of removal of necrosed or detached fragments of the cranial bones after gunshot injuries have been related in previous pages of this Section, in the abstracts of cases in which some other feature was more prominent. The remainder of the cases that were reported, in which operative interference, short of perforating the skull by the trephine, was resorted to, will be recorded in this Subsection. The first series of twenty-eight such cases recovered, with slight disabilities, and were returned to duty:

CASE.—Private *Benjamin Bird*, Co. F, 16th Virginia Regiment, aged 30 years, received, on August 30th, 1862, a gunshot wound in the right temporal region, fracturing the bone and depressing the fragments. He was admitted into the Confederate hospital at Charlottesville, Virginia, and on September 6th, was operated upon, when all detached pieces of bone were removed. The wound healed in six weeks without a single unfavorable symptom. Surgeon J. L. Cabell, P. A. C. S., reported the case.[1]

CASE.—Sergeant James Stapleton, Co. A, 82d Pennsylvania Volunteers, aged 20 years, was wounded while on special duty at Cold Harbor, Virginia, on June 5th, 1864, by a conoidal ball, which fractured and depressed the right side of the frontal bone. He was taken to the field hospital of the 1st division, Sixth Corps, thence conveyed to Washington, D. C., and on the 10th, admitted into Emory Hospital, where the ball was extracted. On June 14th, he was transferred to the general hospital, York, Pennsylvania. He became feverish and suffered great pain. On June 22d, Surgeon Henry Palmer, U. S. V., removed a portion of the bone, leaving the dura mater exposed. The parts surrounding the wound were very much inflamed, swollen, and painful. The wound healed rapidly, and on the 13th of December, 1864, the patient was returned to duty. He is not a pensioner. The case is reported by Surgeon Henry Palmer, U. S. V.

CASE.—Hospital Steward Bernard Blair, 169th New York Volunteers, aged 23 years, was wounded at Dutch Gap, Virginia, August 13th, 1864, by a gunshot missile, which fractured the cranium a little to the right of the vertex. He was admitted to the hospital of the Tenth Corps, and on the 15th, conveyed to Fort Monroe, Virginia. He was furloughed on the 4th of September, 1864. While on leave, a portion of the outer table of the skull was removed by Acting Assistant Surgeon C. L. Hubbell. On the 20th of October, he entered the general hospital at Troy, New York. The wound healed rapidly, and on the 20th of December, 1864, the patient was returned to duty.

CASE.—Corporal William G. Cunningham, Co. A, 44th New York Volunteers, aged 21 years, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal ball, which struck the head just behind the left mastoid process, passed upward and inward, and lodged in a depression of the skull. At the same time he received a flesh wound in the scalp and another in the left shoulder. He was admitted into Seminary Hospital on July 4th, and transferred to the hospital at York, Pennsylvania, on the 19th. The patient stated that he became senseless, and remained so five days, and that he could not speak for nine days. Spiculæ of bone and the ball were removed, and cold water dressings applied, after which the patient improved rapidly. On August 24th, the wound had filled with healthy granulations. A marked depression in the bone behind the mastoid process could be felt. Appetite, assimilation, and secretion were good, but headache recurred about three hours each afternoon. During September, he suffered from erysipelas of the face, but he recovered and was returned to duty on January 15th, 1864. He is not a pensioner. The case is reported by Surgeon E. Swift, U. S. A.

CASE.—Private James Duffy, Co. A, 116th Pennsylvania Volunteers, aged 33 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a piece of shell, which fractured the parietal bones at the apex. He was, on the same day, admitted to the regimental hospital near Falmouth, Virginia; on May 8th, sent to the Mount Pleasant Hospital, Washington, and, on the 12th, transferred to the Satterlee Hospital, Philadelphia. He recovered under simple treatment and was returned to duty on the 24th of October, 1863. He was discharged July 21st, 1865, and pensioned. Pension Examiner Thomas B. Reed, in October, 1867, reports that there is a large depression in the skull, and that fifteen pieces of bone have been removed. The man is subject to fainting spells and dizziness, and cannot bear exposure to the sun.

CASE.—Sergeant John L. Evans, Co. G, 91st Pennsylvania Volunteers, aged 33 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 12th, 1864, by a conoidal ball, which fractured the left parietal bone. He was admitted to the 1st division, Fifth Corps, hospital, and transferred to the Carver Hospital, Washington, on the 14th. Sequestra were removed and simple dressings applied to the wound. On the 20th of June, he was transferred to the McClellan Hospital, Philadelphia, and returned to duty on the 12th of July, 1864. He served with his regiment until the 14th of November, when he was admitted to the Fifth Corps field hospital at City Point, suffering from epilepsy, resulting from the wound of the head. He was again returned to his regiment, served till the 1st of February, 1865; was re-admitted to hospital, and on the 27th, conveyed to Washington on the hospital steamer State of Maine. He entered Campbell Hospital the following day. On the 6th of April, he was transferred to the Mower Hospital, Philadelphia, sent to Turners' Lane on the 12th, thence to McClellan on the 10th of May, and returned to duty on the 7th of June, 1865. He was discharged July 10th, 1865, and pensioned. On January 11th, 1867, Pension Examiner Cumminskey reported that the patient suffered from slight exfoliation from the wound and dizziness. He was unable to ascend elevated places or to be exposed to the heat of the sun without falling down in somewhat like an epileptic fit. Dr. Cumminskey rates his disability one-half and permanent.

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1 *Confederate States Medical and Surgical Journal*, Vol. I, No. 3, page 42. "Eighteen cases of Gunshot Wounds of the Head, observed at the General Hospital, Charlottesville, Virginia." Surgeon Allen is said to have drawn up these abstracts, from notes furnished by different operators.

CASE.—Lieutenant Colonel H. A. Frink, 11th Pennsylvania Volunteers, was, on January 15th, 1863, admitted to the Officers' Hospital, Philadelphia, with a gunshot fracture of the occipital bone at its prominence. A portion of the outer table was necrosed and came away; there were symptoms of compression, but the wound was nearly healed, and the discharge was very slight. On April 1st, a piece of bone the size of a finger nail and one-sixteenth of an inch in thickness, was removed from the outer table. No further complications occurred, and Colonel Frink returned to duty in April, 1863. He is not a pensioner.

CASE.—Private Philip Grace, Co. K, 127th Illinois Volunteers, aged 20 years, was wounded at the siege of Vicksburg, May 19th, 1863, by a musket ball, which passed through the right ear and fractured the mastoid process. He was conveyed to Blair's division hospital, where he remained until the 4th of June, was then removed to the Fifteenth Corps hospital, and thence sent to the general hospital at Mound City, Illinois, on July 28th. He suffered from vertigo and headache, and the wound was still discharging. On August 21st, a piece of necrosed bone, one-fourth of an inch in diameter and one-eighth of an inch in thickness, was removed. He improved gradually, and by the 30th, the wound had entirely healed. Patient had intermittent fever, which soon subsided. He was placed on duty as nurse, acting in that capacity until April 25th, 1865, when he was returned to duty. He is not a pensioner.

CASE.—Private Alexander Hamilton, Co. C, 17th United States Infantry, aged 33 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 9th, 1864, by a conoidal ball, which fractured the cranium at the vertex. On the same day, he was admitted to the hospital of the 4th division, Fifth Corps, where the detached portions of bone were removed from the wound. On May 12th, he was sent to the Columbian Hospital, Washington; on May 15th, to the Patterson Park Hospital, Baltimore, and on June 20th, to Camp Parole, Annapolis, whence he was sent, on September 12th, 1864, to Fort Preble, Maine, probably for duty. This soldier was discharged the service, March 31st, 1865, and pensioned. On January 27th, 1867, Pension Examiner G. W. Cook reported that the integument does not cover the wound; the patient complains of headache, which he alleges prevents him from laboring. His disability is rated one-half and temporary.

CASE.—Private Lewis W. James, Co. B, 3d Wisconsin Volunteers, aged 18 years, was wounded at Atlanta, Georgia, July 20th, 1864, by a conoidal ball, which penetrated the right side of the *os frontis* at the external angular process, and lodged within the cranium. He was admitted, on the following day, to the hospital of the 1st division, Twentieth Corps, where the ball was extracted with the bullet forceps by Surgeon Darius Mason, 31st Wisconsin Volunteers. On July 29th, he was conveyed to the Cumberland Hospital at Nashville, Tennessee, where three pieces of bone were removed on August 6th. On August 23d, he was transferred to the Jefferson Hospital, Jeffersonville, Indiana, and, on September 4th, admitted to the Simons Hospital, Mound City, Illinois. The wound was healing kindly; the discharge healthy. He suffered from continual headache, and complained of numbness over the right eye. On September 24th, he was sent to Keokuk, Iowa, but again transferred to the Harvey Hospital at Madison, Wisconsin, on February 23d, 1865, whence he was returned to duty on February 25th, 1865. He was discharged in July, 1865, and his claim for pension is still pending.

CASE.—Private Robert Linton, Co. D, 14th United States Infantry, aged 19 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 13th, 1864, by a fragment of shell, which fractured both tables of the frontal bone. He was at once admitted to the 1st division, Fifth Corps, hospital, and on May 24th, transferred to the Finley Hospital, Washington. He experienced periodical attacks of dizziness and some headache until June 1st, when Acting Assistant Surgeon F. G. H. Bradford removed several fragments of bone from the wound. Simple dressings were applied; the patient recovered rapidly, and was returned to his regiment for duty on August 26th, 1864. He is not a pensioner.

CASE.—Private John Mock, Co. H, 53d Pennsylvania Volunteers, aged 19 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 12th, 1864, by a conoidal ball, which fractured and depressed the left parietal bone. He was immediately admitted into the hospital of the 1st division, Second Corps, and thence transferred to the Columbian College Hospital, Washington, on the 21st, and on the following day, the ball and portion of bone were removed. On May 31st, he was transferred to the Cuyler Hospital, Philadelphia, and finally returned to duty on October 24th, 1864. He is not a pensioner.

CASE.—Private John Montague, Co. K, 7th Indiana Cavalry, aged 19 years, was wounded while on picket near Memphis, Tennessee, July 16th, 1864, by the accidental bursting of his gun, which caused lacerated wounds of hand, face, and right eye, and fractured the frontal bone. He was admitted to the Adams Hospital, Memphis, on the 17th. He was, on the same day, placed under the influence of chloroform, and Surgeon J. G. Keenan, U. S. V., removed fragments from the frontal bone, exposing the dura mater above the orbit of the eye to the extent of two inches in length by one-half inch in width, and extirpated the right eye. Full diet, iron, quinine, wine, and whiskey, were ordered, and simple dressings applied. By the 31st of August the parts had nearly healed, and on January 17th, 1865, the patient was returned to duty. He is not a pensioner. The case is reported by the operator, Surgeon J. G. Keenan, U. S. V.

CASE.—Private Reuben L. Patterson, Co. K, 14th West Virginia Volunteers, aged 34 years, was wounded at Halltown, Virginia, on the 26th of August, 1864, by a conoidal ball, which fractured and depressed the left parietal bone. On the following day, he was admitted into hospital at Sandy Hook, Maryland, and thence transferred, on the 28th, to the hospital at Frederick. He complained of headache, his tongue was coated white, bowels costive, and there was considerable fever, with frequent and small pulse. A fragment of ball, which was found wedged in between the tables of the skull, was removed. On the 3d of September, the headache and fever continuing, Assistant Surgeon R. F. Weir, U. S. A., removed the depressed bone with bone gouge forceps and elevator. By the 10th, the patient was free from headache, his pulse became natural, appetite good, tongue clean, and his bowels regular, his diet being principally farinaceous. On September 20th, he was able to sit up and sometimes walked about the ward; his general health improving rapidly, and healthy granulations covering the wound. On the 4th of November, he received a furlough for thirty days, and left the hospital in excellent spirits, the wound being nearly healed. On the same day, he entered the general hospital at Grafton, West Virginia, where he remained until the 26th of May, 1865, when he was returned to his regiment for duty. He was discharged June 27th, 1865, and pensioned, his disability being rated one-half and permanent. The case is reported by Acting Assistant Surgeon R. M. Mansfield.

CASE.—Corporal Richard H. Pearl, Co. B, 31st Maine Volunteers, aged 20 years, was wounded at the battle of Petersburg, Virginia, June 28th, 1864, by a conoidal musket ball, which fractured the right temporal bone. He was admitted to the hospital of the 2d division, Ninth Corps, on the same day, where several pieces of bone were removed. Thence he was conveyed by hospital steamer to Washington, and admitted into the Carver Hospital on July 5th. On the 18th, he was transferred to Blackwell's Island, New York Harbor, and in September, sent to Augusta, Maine. He recovered and was returned to duty on February 4th, 1865. He was discharged June 6th, 1865, and pensioned, his disability being rated total and permanent. Pension Examining Surgeon S. Willey, St. Paul, Minnesota, under date June 24th, 1868, reports that the outer edge of the right orbit, where loss of substance occurred, is unhealthy, red, and painful. The conjunctiva of the left eye is injected, the pupil dilated, and the power of sight diminished. Exertion or stooping causes vertigo. There had been temporary loss of memory and frequent pains back of the orbits.

CASE.—Private Edward Powers, Co. F, 11th New Jersey Volunteers, was wounded at the battle of Gettysburg, July 2d, 1863, by a conoidal ball, which fractured and depressed both tables of the frontal bone in the median line, and lodged. He was admitted into Seminary Hospital, at Gettysburg, on the same day, and on July 5th, the ball and depressed fragments of bone were removed from the wound. The patient was transferred, on the 13th, to the Camden Street Hospital, Baltimore. The pulsations of the brain were distinctly visible over a space an inch in diameter. The portions of the outer table surrounding the orifice being denuded and in a state of necrosis, and becoming nearly detached, were easily removed with dressing forceps on the 2d of August. Simple dressings were applied. The case progressed favorably, and on the 2d of October, 1863, Powers was returned to duty, and discharged March 18th, 1864. The case is reported by Surgeon Z. E. Bliss, U. S. V. In October, 1865, Pension Examiner Thomas B. Reed states that the man suffers from headache, dizziness, inability to stoop, impaired memory and intellect.

CASE.—Private Thomas Prescott, Co. K, 110th Pennsylvania Volunteers, aged 21 years, was wounded before Petersburg, Virginia, August 18th, 1864, by a fragment of shell, which fractured the skull at its posterior portion. He was immediately admitted to the 3d division, Second Corps, hospital at City Point, Virginia; thence sent to Washington, where he entered the Finley Hospital on August 27th. On the 1st of September, symptoms of compression supervened. A careful examination revealed a spicula of bone driven into the brain substance, also slight depression of the bone upon the side of the opening. The patient having been placed under the influence of chloroform, the wound was freely opened and several pieces of bone were removed by Acting Assistant Surgeon F. G. H. Bradford, relieving the compression. The case progressed favorably, and on the 12th of September the patient was furloughed. On December 12th, he was admitted to the 3d division, Second Corps, hospital at City Point, Virginia, and returned to duty on December 21st, 1864. He is not a pensioner. The case is reported by Surgeon G. L. Pancoast, U. S. V.

CASE.—Sergeant Martin V. B. Quick, Co. B, 6th New York Cavalry, aged 24 years, was wounded at Sailors' Creek, Virginia, April 6th, 1865, by a ball from a canister shot, which struck the left side of the forehead, transversely, producing a compound comminuted fracture of both tables of the frontal bone just below the protuberance; the scalp was severely lacerated, and the brain pulsations distinctly visible. Surgeon A. P. Clarke, 6th New York Cavalry, removed several fragments of bone immediately after the reception of the injury, dressed the wound, and administered stimulants. Quick was conveyed to the field hospital of the 1st division, Cavalry Corps, and after several days, transferred to City Point, Virginia, entering the Cavalry Corps depot field hospital on the 14th. On the following day he was transferred, per hospital steamer Connecticut, to Washington, entering Lincoln Hospital on the 16th, and thence, on the 22d of May, to Satterlee Hospital, Philadelphia. The wound was still open, with some necrosis. Water dressings were applied and full diet ordered. The case progressed favorably, and on the 12th of July, the patient was returned to duty, the wound having healed. He is not a pensioner.

CASE.—Private Crowell J. Ramsey, Co. C, 4th Maine Volunteers, aged 21 years, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a musket ball, which fractured and depressed the upper posterior portion of the cranium, a little to the right of the median line; he also received a slight flesh wound of the left hand. He was conveyed to the regimental field hospital, and on the 15th, was transferred to the 3d division hospital, Alexandria, in a convalescent condition. On January 7th, 1863, he was sent to Lovell Hospital, Portsmouth Grove, Rhode Island, and on March 2d, 1863, returned to duty. On the 15th of June, he entered 2d division hospital, Alexandria, with cerebral symptoms, caused by depression of a portion of the fractured cranium, a fragment of which was removed. By the 1st of September, the wound was entirely closed, all cerebral symptoms had disappeared, and on the 15th of January, 1864, he was returned to duty. He is not a pensioner.

CASE.—Private Erastus R. Rugg, Co. I, 7th Wisconsin Volunteers, aged 43 years, was wounded at the battle of the Wilderness, Virginia, May 5th, 1864, by a conoidal ball, which penetrated the left temporal bone and passed through the dura mater. He was, on the following day, admitted to the 4th division, Fifth Corps, hospital, and on the 12th, transferred to the Douglass Hospital, Washington. Simple dressings were employed. On May 28th, he was sent to the Broad and Cherry Streets Hospital, Philadelphia, where a small piece of necrosed bone was extracted from the wound. The missile had been previously removed. The patient remained at the above hospital until the 27th of June, when he was transferred to the Haddington Hospital. He recovered, and was returned to duty on February 11th, 1865. He was discharged July 6th, 1865, and pensioned. A communication from the Commissioner of Pensions, January 20th, 1870, states that there is a deep depression at the seat of injury. The functions of the right ear are lost, those of the left are tremulous and weak, and the man is subject to dizziness upon slight exertion.

CASE.—Private Joseph F. Singer, Co. E, 24th Wisconsin Volunteers, aged 24 years, was wounded in a skirmish at Dallas, Georgia, May 27th, 1864, by an explosive bullet, which fractured the external table of the occipital bone at its superior portion, near the right parietal bone. He was admitted to the hospital of the 2d division, Fourth Corps, on the same day, and on the 3d of June, was sent to Hospital No. 3, Nashville, Tennessee, suffering considerably from headache, occasioned by the

existence of partially detached scales of bone at the seat of fracture. The pain, however, ceased as soon as the fragments were removed. On July 16th, he was transferred to the Jefferson Hospital in Indiana, and on September 4th, was conveyed by steamer to the Mound City Hospital in Illinois; the wound was still discharging, but his general health was good. On September 24th, he was sent to the Keokuk Hospital, Iowa, and from there returned to duty on the 12th of December, 1864. He was discharged on June 22d, 1865. The case is reported by Surgeon M. K. Taylor, U. S. V. A communication from Pension Examiner E. Kramer, dated May 19th, 1869, stated that the cicatrix was very tender and the scalp was bald. The patient suffered from headache and dizziness, especially in hot weather. He rated his disability two-thirds and permanent.

Case.—Private Rivers H. Trask, Co. A, 114th New York Volunteers, aged 23 years, was wounded at Winchester, Virginia, September 19th, 1864, by a conoidal ball, which passed antero-posteriorly over the left frontal protuberance, producing, seemingly, a flesh wound of the scalp, half an inch wide and an inch long. He was, on the same day, admitted to the hospital of the 3d division, Sixth Corps, thence sent to the field hospital at Sandy Hook, Maryland, on the 23d, and on the following day transferred to Philadelphia, entering Satterlee Hospital on the 25th. The wound looked healthy, but the patient complained of dull pain over the left eyebrow, and his pupils appeared to be rather dilated. His mind was confused and his articulation difficult. Quiet, low diet, and simple dressings were ordered. On the following day, the pain was more severe and the pupils more dilated. A severe epileptic fit supervened on the 27th, which lasted forty-five minutes, and a state of semi-unconsciousness followed, while the pulse was full, regular, and very slow. His pupils dilated still more, and for two hours after the convulsion his respiration was stertorous. On the following day, he was placed under the influence of one part of chloroform and three parts of ether. A free crucial incision was made in the nearly cicatrized scalp, which revealed a well-marked depressed fracture of the bone. Fragments covering one and a half square inches of both tables were removed, exposing the dura mater much congested. On recovering from the anæsthesia, the patient seemed to breathe more fully and said that the pain in the head was relieved. Two teaspoonfuls of solution of morphia every two hours were ordered and no food allowed for the first day, and for twelve days no other nourishment than beef essence was permitted. The head and face were attacked with erysipelas on the fourth day after the operation. Tinct. ferri chlor. was freely administered for several days. On the 11th of October some light food was allowed, and on the 20th, full diet ordered. By the middle of November, the wound had closed and the patient was perfectly well. He was furloughed on the 18th of January, 1865, returned to hospital on the 8th of February, and was returned to duty on February 14th, 1865. He is not a pensioner.

Case.—Private Noah Truitt, Co. E, 11th United States Infantry, aged 34 years, was wounded in an engagement at Petersburg, Virginia, June 18th, 1864, by a fragment of shell, which caused a fracture of the frontal bone. He was admitted to the hospital of the 2d division, Fifth Corps, on the same day, and thence conveyed to Alexandria, and, on the 2d of July, admitted into the 2d division hospital; but shortly afterward was sent to the Broad and Cherry Streets Hospital, and thence to the Haddington Hospital at Philadelphia. During the progress of the case, spiculæ of bone were removed from the external table. The patient recovered, and was returned to duty December 14th, 1864. He was discharged February 22d, 1865, and pensioned. His disability is rated two-thirds.

Case.—An unknown *Confederate soldier* belonging to Nichols's Louisiana Brigade, was wounded at the battle of Chancellorsville, Virginia, May 2d, 1863. The missile entered the frontal bone from oblique direction, passed inward and lodged about two inches posterior to the wound of entrance. In entering the cavity of the cranium, the ball came in contact with the opposite margin of the orifice in the bone, and was deflected in its course. An ounce or two of cerebrum was lost. The ball, considerably flattened, could be felt with the point of the little finger. The patient being semi-conscious, the opening in the cranium was enlarged by Hey's saw and the ball extracted. The case progressed favorably, the patient recovered, and was afterward returned to duty.

Case.—Private Richard Upham, Co. B, 36th Wisconsin Volunteers, aged 42 years, was wounded at Cold Harbor, Virginia, June 1st, 1864, by a conoidal musket ball, in the right side of the head. He was, on June 8th, admitted to the Lincoln Hospital, Washington, where the injury was diagnosed as a wound of scalp. On June 18th, he was conveyed to Philadelphia, and admitted into the Summit House Hospital. The wound was then indolent. On the 24th of August, he was transferred to Satterlee Hospital, where it was ascertained that the parietal bone was fractured at the articulation with the frontal bone, one and a half inches from the median line. Simple dressings were applied to the wound. Quite a number of small speculæ of bone were removed. The case progressed favorably and the wound healed, leaving a depression of one-half inch. He was returned to duty on December 10th, 1864, but still suffered from vertigo after much exertion. He was discharged July 12th, 1865, and his claim for pension is pending.

Case.—Private James A. J. Williams, Co. A, 2d Kentucky Cavalry, aged 18 years, was wounded at Dairysville, Georgia, October 9th, 1864, by a conoidal ball, which fractured the superior border of the parietal bone. He entered Hospital No. 1, Nashville, Tennessee, on the 1st of November, complaining of constant pain in his head. On the 7th, the pulse was intermittent, very irregular, from 50 to 75 per minute; his bowels were constipated, and there was a profuse discharge of carious pus from the opening in the wound, also a small abscess beneath the dura mater. He was placed under the influence of chloroform, and Acting Assistant Surgeon M. L. Herr made a crucial incision two and a half inches in extent and removed the fractured portions of bone, exposing the brain substance. Cold water dressings were applied and low diet ordered. The wound healed rapidly. He was transferred to the Jefferson Hospital, Jeffersonville, Indiana, on the 11th of December, and returned to duty on the 7th of February, 1865. He was discharged May 25th, 1865, and died February 28th, 1867, of inflammatory softening of the brain.

Case.—Private Andrew J. Gordon, Co. A, 31st Ohio Volunteers, aged 21 years, was wounded at the battle of Chickamauga, Georgia, September 20th, 1863, by a conoidal musket ball, which fractured the parietal bone, producing a large depression. Being conveyed to Nashville, Tennessee, he was admitted, on the 25th, into Hospital No. 3. Simple dressings only were required; the patient recovered rapidly; was transferred to No. 15, October 7th; thence to No. 19, February 13th, 1864, and

returned to duty on March 9th, 1864. He was discharged September 19th, 1864, and pensioned. On November 30th, 1869, Pension Examiner J. R. Beck reports that a large depression existed over the seat of the wound, through which the pulsations of the meningeal artery could be clearly distinguished. The patient was subject to cerebritis upon the slightest exposure. The effects of his emotions, such as rage, joy, or fear, produced attacks of insensibility. He could not endure the heat of a warm room and was unable to perform any labor requiring mental or muscular effort. He rates his disability total and permanent.

CASE.—Private George W. Ramsey, Co. A, 10th Connecticut Volunteers, was wounded in the engagement at Roanoke Island, North Carolina, February 8th, 1862, by a conoidal ball, which entered about one inch posteriorly to the fronto-parietal suture, and about two and a half inches above the ear on the left side, and passed in an oblique direction from before backward. When brought to the field hospital, he was insensible, surface cold, breathing stertorous, pulse slow, about 40. Stimulants were freely given and the loose portions of bone removed by Surgeon J. H. Thompson, U. S. V. In the evening, eight hours after the reception of the injury, he was still unconscious, and there was that peculiar whiffing by the mouth during expiration which frequently accompanies grave cases of compression; the eyes were fixed and the pupils much dilated. During the night, there was convulsive action of the left arm and leg; the right side appeared paralyzed; the left eye was suffused and protruded considerably. A clot of blood which partially filled the wound was removed, and the patient laid upon his left side to give an opportunity for the blood to drain from the wound; the bladder was emptied by catheter and a strong cathartic administered. In the afternoon of the second day there was considerable improvement. He appeared to understand what was said to him, giving signs with his left hand. The pupils were not so much dilated. From the time he was turned over upon his side, the paralysis gradually diminished, and the patient seemed to improve each hour. Speech slowly returned but was not perfect. Notwithstanding this marked improvement, his case was considered hopeless, for it was known that the ball was within the cranium and the patient thus subjected not only to the danger arising from the compression but to the almost certain one, inflammation and probable subsequent softening which the presence of such a foreign body would produce. On the morning of the fourth day after the battle, the operator was astonished to see the man sitting on a log before the fire smoking his pipe. His answers to questions were given with some hesitation, but were correct and rational. From this time onward all his functions were performed normally, and at the end of three weeks he went home on furlough. The operator saw him on the day he left, there was still a weakness hardly amounting to paralysis of the right side, considerable deafness, and the left eye much protruded and congested; otherwise he presented no indication of having so recently been the victim of such a severe injury. He recovered and re-enlisted as a veteran in the same regiment on February 8th, 1864. He is not a pensioner. The case is reported by the operator, Surgeon J. H. Thompson, U. S. V.

CASE.—Private Abram D. Heiser, Co. H, 1st Pennsylvania Reserves, was, on September 3d, 1862, admitted to South Street Hospital, Philadelphia, with a gunshot fracture of the frontal bone, involving the frontal sinus. Adhesive strips and warm water dressings were applied to the wound, and on the following day a small piece of bone was removed. On September 5th, he was seized with convulsions, when constant ice applications to the head were ordered, and calomel and syr. rhei aromat. were administered. The patient improved and was, on September 7th, entirely rational. Ice applications were continued, and on September 9th, two pieces of bone were removed from the wound. On September 17th, the wound suppurated freely and the patient was doing well; an unsuccessful search was made for the ball. On September 22d, several pieces of necrosed bone came away, and the discharge had become offensive. Ice dressings were discontinued, and the patient was ordered to lay on his side. On September 26th, the wound was again carefully examined, the probe could be passed far down the frontal sinus without the least obstruction; at the upper and outer side it came in contact with some hard and firm material, but whether bone or bullet could not be ascertained. Sloughing of necrosed bone continued until March 20th, 1863, when a large piece of both tables was removed through incision. All necrosed portions of bone being removed, the wound healed rapidly. No ill effect remained, save a slight numbness at a place about two inches from the seat of injury. He was returned to duty March 30th, 1863. The man is not on the pension rolls. The case is reported by Acting Assistant Surgeon Henry C. Hart.

Seventeen patients with depressed gunshot fractures of the skull, who had been treated by the removal of detached fragments of bone, recovered sufficiently to go to modified duty in the Veteran Reserve Corps. Eleven of them appear to have ultimately completely recovered:

CASE.—Private Bradley Allen, Co. I, 20th Connecticut Volunteers, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a piece of a shell, which fractured the frontal bone one inch above the right eyebrow and frontal sinus. He was admitted into Seminary Hospital at Gettysburg, on the same day, and was insensible for five days. On July 20th, he was transferred to the hospital at York, Pennsylvania. There was a star-shaped flesh wound, with one of its tails extending across the outer extremity of the brow, and reaching three-fourths of an inch to the outside of the external angle of the left eye. There was extensive swelling and redness, but not much pain, and ecchymosis of the upper eyelid. A fragment of bone was removed, after which the patient improved gradually under a supporting treatment. On August 24th, the wound was irregularly shaped, almost an inch across, and was filled with granulations which were soft and flabby. There was marked depression of the forehead at that point, while the supra-orbital arch appeared to be broken. The brow was much deformed. The upper lid was of a dark red color, filled with serum, and was, with much difficulty, lifted off the eye, which was uninjured. By the 1st of November, the discoloration of the eyelid had almost disappeared, but the upper lid was still affected with ptosis. The wound in the integuments over the forehead had closed to a mere point. He was transferred to the Veteran Reserve Corps on February 15th, 1864.

CASE.—Private Joseph N. Day, Co. H, 34th Massachusetts Volunteers, aged 23 years, was wounded at the battle of Winchester, Virginia, September 19th, 1864, by a conoidal ball, which fractured the occipital bone, with slight depression. He

was, on the same day, admitted to the hospital of the 1st division of the Army of West Virginia, and thence, on the 27th, sent to the Mower Hospital at Philadelphia. Here, three small pieces of bone were removed. The treatment related refers more particularly to the topical dressings. On the 1st of January, 1865, the patient was transferred to the Dale Hospital in Massachusetts. Upon his recovery he was transferred to the Veteran Reserve Corps, May 2d, 1865. He is not a pensioner.

Case.—Sergeant Joseph C. Fox, Co. F, 156th New York Volunteers, aged 30 years, was wounded at the battle of Winchester, Virginia, September 19th, 1864, by a conoidal ball, which fractured and depressed the left side of the frontal bone. He was admitted to the hospital of the 2d division, Nineteenth Corps, and, on the 22d, was sent to the depot field hospital. On September 25th, the missile and some fragments of bone were extracted, while the patient was under the influence of chloroform. Simple dressings were applied. On October 17th, he was transferred to the Cuyler Hospital, Germantown, Pennsylvania, and on October 21st and 27th, Acting Assistant Surgeon John Ashhurst removed fragments of bone. Slight head symptoms existed at the time; but the wound healed rapidly. On May 10th, 1865, the man was sent to the Mower Hospital, and on May 16th, 1865, he was transferred to the Veteran Reserve Corps. He is not a pensioner.

Case.—Private Jacob S. Jessup, Co. D, 18th Pennsylvania Cavalry, aged 22 years, was wounded at a skirmish at St. Mary's Church, Virginia, June 15th, 1864, by a fragment of shell, which fractured the right parietal bone. He was admitted to the field hospital of the 3d division, Cavalry Corps, and thence sent to New York and admitted, on the 25th, into the McDougall Hospital. On the 23d of September, he was sent to the Haddington Hospital in Philadelphia. During the treatment of the case several spiculæ of the external table were removed. Jessup was transferred to the Veteran Reserve Corps on March 2d, 1865. He is not a pensioner. Surgeon J. Hopkinson, U. S. V. recorded the case.

Case.—Corporal John B. Merritt, Co. B, 170th New York Volunteers, aged 22 years, was wounded at Petersburg, Virginia, June 16th, 1864, by a conoidal ball, which produced a compound fracture of the frontal bone, over the supra-orbital region. On the same day, several pieces of bone were extracted by Acting Assistant Surgeon DuBois. The patient was admitted to the hospital of the 2d division, Second Corps, and thence conveyed to the hospital at Portsmouth Grove, Rhode Island, on the 26th. On August 11th, he was admitted into Grant Hospital, Willett's Point, New York Harbor. By the 5th of December, 1864, the wound had closed, leaving a large scar over the eye. On the 25th of January, 1865, Merritt was transferred to the Veteran Reserve Corps. He is not a pensioner.

The next case refers to a man who, apparently, belonged to one of the classes of recruits who were known during the latter part of the war as "Bounty Jumpers;" the class of disabled men, who, through the culpable negligence of the local examining officers, were allowed to again and again re-enlist, and to receive the large bounties then offered, only to be discharged in a few weeks or to encumber the hospitals:

Case.—Private George Moritz, Co. I, 7th United States Infantry, aged 34 years, was wounded at the battle of Chancellorsville, Virginia, May 1st, 1863, by a conoidal ball, which entered the right parietal bone, near the coronal suture, producing a stellate fracture of both tables, and lodged. The ball and portions of comminuted bone were removed on the field, through a crucial incision. The patient was conveyed to Washington, and entered Lincoln Hospital on the 15th of June, remaining until the 11th of September, when he was returned to his regiment to be mustered out of service. On the 4th of January, 1864, he entered the 3d division hospital, Alexandria, Virginia, as a recruit of the 2d New York Cavalry. On March 31st, he was transferred to Fairfax Seminary Hospital, near Alexandria, Virginia, and discharged from the service on the 5th of May, by reason of impaired intellect and derangement of the nervous system, being unfit for the Veteran Reserve Corps. On the 5th of July, 1864, he entered Carver Hospital, Washington, as a private of Co. D, 7th New Jersey Volunteers, suffering from cephalalgia to such an extent as to entirely disable him for duty. The wound was entirely healed. There was a depression over the right parietal protuberance about an inch in diameter, and half an inch in depth. On the 30th of September, he was placed on light duty in the hospital, and on the 25th of April, 1865, transferred to the Veteran Reserve Corps. He is not a pensioner.

Case.—Private Charles Rogers, Co. G, 44th Illinois Volunteers, aged 20 years, was wounded at the battle of Chickamauga, Georgia, September 20th, 1863, by a round ball, which fractured the right parietal bone, a second ball lodged beneath the lachrymal sac, and a third struck near the centre of the left orbit at the lower margin. He was admitted into hospital at Stevenson, Alabama, on the 25th; transferred to Hospital No. 8, Nashville, Tennessee, October 28th; sent to Hospital No. 3, Louisville, Kentucky, November 29th, and, on the following day, again transferred to the hospital at Quincy, Illinois. A portion of both tables of the skull had been removed previous to his admission to the latter hospital. Simple dressings and full diet were ordered. He recovered and was transferred to the Veteran Reserve Corps on the 23d of March, 1864. He is not a pensioner. Acting Assistant Surgeon F. K. Baily reports the case.

Case.—Sergeant John Reagan, Co. I, 37th Wisconsin Volunteers, aged 30 years, was wounded near Petersburg, Virginia, June 18th, 1864, by a conoidal ball, which lacerated the scalp, and slightly fractured the left parietal bone near the junction of the coronal and sagittal sutures. He also received a gunshot wound of the leg. He was admitted to the hospital of the 3d division, Ninth Corps, sent to City Point, Virginia, and thence conveyed per Hospital Steamer Connecticut to Annapolis, Maryland, entering 1st division hospital on June 20th. On the 17th of August, he was transferred to the hospital at York, Pennsylvania, where, on the following day, a small piece of bone was removed. The wound was dressed with cold water, and in about two weeks was entirely healed. Spasms occurring, the wound was reopened with a view to discover the cause, but nothing unusual could be observed. The patient was furloughed on the 23d of September, 1864, re-admitted on October 17th, and remained until the 13th of March, 1865, when he was transferred to the Veteran Reserve Corps. He is not a pensioner.

CASE—Corporal J. Y. Schamline, Co. I, 51st Pennsylvania Volunteers, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a piece of shell, which fractured and depressed the frontal bone to the left of the median line, near the coronal suture. He fell senseless, but consciousness soon returned, when he was conveyed from the field. He was taken to Washington, and entered the Judiciary Square Hospital on the 18th, where coma supervened. During the evening of the same day, several fragments of bone were removed and the depressed portions elevated. No anæsthetic was used. The patient rallied and became partially sensible; strabismus disappeared before morning. On the second day after the operation, his pulse was 76, appetite fair, but the mind rather slow. On the 1st of January, 1863, he was a little giddy and complained of slight headache, but was otherwise improving rapidly. He was transferred to the Invalid Corps on May 17th, 1863. He is not a pensioner.

CASE.—Private Reuben Lysle, Co. I, 148th Pennsylvania Volunteers, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a piece of shell, which fractured and depressed both tables of the cranium. Surgeon C. S. Wood, U. S. V., laid open the scalp, extracted the loose portions of the bone, and elevated the depressed parts. The brain, apparently, was not injured. For several weeks he was treated in the 1st division, Second Corps, field hospital, and on June 14th, admitted into Carver Hospital, Washington. On the 16th, he was transferred to West's Building Hospital, Baltimore, and thence, on July 4th, to the general hospital, Point Lookout, Maryland. He recovered and was transferred to the Veteran Reserve Corps, June 28th, 1864. The case is reported by the operator, Surgeon C. S. Wood, U. S. V. The patient's name does not appear upon the Pension List.

CASE.—Private Albert Sebers, Co. B, 1st Minnesota Volunteers, aged 20 years, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a fragment of shell, which fractured the right parietal bone near the vertex. He was also struck in the left leg by a conoidal ball, which entered at the middle third upon the front surface, between the tibia and fibula, and passed directly upward, injuring the head of the fibula, whence it was cut out by a free incision at the outer side of the knee. He was admitted to the Seminary Hospital, Gettysburg. The leg began to swell and considerable pus formed in front of the semi-membranosus along the outside of the thigh. On July 6th, the pus was evacuated, and a gradual improvement took place. On July 18th, he was sent to the hospital at York, Pennsylvania. A small piece of bone was removed from the cranium, and from the aperture left, at different times, small portions of brain exuded. For a few days, the patient suffered from dizziness; but the wound healed kindly, and, in December, 1863, it was covered with scalp and hair. The wound of the leg had also healed; but the leg was somewhat weak and could not be straightened. He was transferred to the Veteran Reserve Corps on December 24th, 1863. He is not a pensioner. The case is reported by Acting Assistant Surgeon H. F. Bown, U. S. A.

In five of the cases of the foregoing series the fractures were produced by shell fragments, and in six, by musket balls.

The names of six of the patients who had undergone operations for the removal of detached fragments of bone after depressed gunshot fractures of the skull, are found on the Pension Roll. Three of these pensioners suffered from epileptiform convulsions, two from dizziness and impaired vision, and one from headache and nervousness:

CASE.—Private Sebastian Langendorf, Co. H, 14th Ohio Volunteers, aged 37 years, was wounded at Atlanta, Georgia, August 6th, 1864, by a conoidal ball, which fractured the left side of the frontal bone, just anterior to the coronal suture. He was at once admitted to the hospital of the 3d division, Fourteenth Corps, thence was conveyed to Nashville, Tennessee, where he entered Hospital No. 1, on the 17th. The brain substance was exposed to view. On the 6th of October, a circular piece of bone, over an inch in diameter, was removed. Simple dressings were applied. On the 25th of November, the patient was transferred to Evansville, Indiana, where he remained until the 16th of January, 1865, when he was sent to Camp Dennison, Ohio. He was finally transferred to the 1st Battalion, Veteran Reserve Corps, on March 31st, 1865. A. M. M. Phot. Series, Vol. 1, page 6. This soldier was discharged the service August 5th, 1865, and pensioned, because of epilepsy. On November 12th, 1867, Pension Examiner Samuel S. Thorn rates his disability total and temporary.

CASE.—Sergeant L. E. Clark, Co. E, 26th Michigan Volunteers, aged 21 years, was wounded near Petersburg, Virginia, June 17th, 1864, by a conoidal ball, which fractured the right temporal bone, two inches above the ear, and lodged. He was conveyed to the hospital of the 1st division, Second Corps, and remained insensible until the next day, when the ball was extracted and several fragments of bone were removed. The operation gave great relief; but the left arm and leg remained paralyzed until the middle of July, when the patient recovered the use of the leg, and partial use of the arm. For two or three days after the removal of the ball, he was almost totally blind; but, in December, his vision was only slightly impaired. He was, on December 9th, sent to Augur Hospital, Alexandria; on December 16th, to Armory Square, Washington, and on February 20th, 1865, to Cliffburne Barracks, whence he was transferred to the Veteran Reserve Corps on March 25th, 1865. He was discharged the service June 28th, 1865, and pensioned. In June, 1866, Pension Examiner R. C. Hutton reported that the man needs constant watching on account of loss of intellect, and of frequently recurring spasms, caused by compression of the brain.

CASE.—Private Alfred Green, Co. H, 76th Pennsylvania Volunteers, aged 22 years, was wounded at Fort Wagner, South Carolina, July 11th, 1863, by a conoidal musket ball, which fractured the frontal bone, right side. He was taken prisoner and remained in the hands of the enemy until September 30th, when he was admitted to the 2d division hospital at Annapolis, Maryland. In October, he was transferred to Philadelphia, where he arrived at the Satterlee Hospital on the 25th. Several small spiculæ of bone had been removed from time to time, but the wound was nearly healed, leaving a deep scar. On January 25th, 1864, he was transferred to the Veteran Reserve Corps, and was discharged October 28th, 1864. In February, 1870, Pension Examiner A. Davis reported that the man is subject to frequent and severe convulsions of an epileptic character, which occur on an average once a week, and last from one-half to six hours.

CASE.—Private John W. Kidder, Co. A, 2d Massachusetts Volunteers, aged 23 years, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal ball, which fractured both tables of the skull without causing depression. He remained in the field hospital until the 18th, when he was transferred to the hospital at York, Pennsylvania. He so far recovered from the injury that he was transferred to the 1st battalion, Veteran Reserve Corps on the 24th of December, 1863. He was discharged July 25th, 1864. In January, 1868, Pension Examiner Nathan Allen reported that this man suffers from dizziness and loss of sight upon stooping or excitement.

CASE.—Private Elkanah B. Vondersmith, Co. H, 88th Illinois Volunteers, aged 39 years, was wounded at Dallas, Georgia, May 29th, 1864, by a conoidal ball, which fractured the outer table of the cranium at the apex and lacerated the scalp extensively. He was, on the following day, admitted into the field hospital of the 2d division, Fourth Corps, whence he was transferred to Ackworth, Georgia, on the 8th of June. On the 17th, he entered the general field hospital at Chattanooga, Tennessee; was transferred on the 29th, to Louisville, Kentucky, entering Totten Hospital on the 30th; on July 5th, sent to Jefferson Barracks Hospital, Missouri, and on the 27th, transferred to Quincy, Illinois. A small piece of the outer table of the skull was removed on the 4th of August. Simple dressings were applied, and full diet was ordered. The wound healed rapidly, and by the 1st of January, 1865, it had entirely closed. The patient's general health was excellent; but he could not endure much fatigue. He was transferred to the 2d battalion of the Veteran Reserve Corps on the 13th of February, 1865, and discharged from the service July 15th, 1865, and pensioned. Pension Examiner A. F. Hand, under date of August 28th, 1865, reports that the man is unable to do anything by reason of dizziness and blindness on stooping.

CASE.—Private A. J. Williamson, Co. C, 19th Indiana Volunteers, aged 25 years, received, at the battle of Gettysburg, Pennsylvania, July 1st, 1863, a gunshot injury of the cranium. The missile entered at the vertex and made an opening about three inches in length. The bone, apparently, was not injured. He was admitted to the hospital of the 1st division, First Corps, and on July 7th, sent to Mower Hospital, Philadelphia. On July 8th, the wound had almost healed; the granulations, being somewhat profuse, were touched with nitrate of silver. On August 27th, the patient complained of pain in the chest, and a blister was applied, giving relief. On August 29th the wound had become painful and discharged more freely than usual, and on May 31st, a piece of the outer table of the skull, almost the size of a thumb nail, was removed. The wound then healed, but the man complained of vertigo. He was transferred to the 2d battalion Veteran Reserve Corps, and on December 19th, 1863, sent to Indianapolis, Indiana. He was discharged April 6th, 1864, and pensioned. He suffers from constant headache and nervousness, and his disability is rated total.

In the sixteen following cases, in which fragments of bone were removed after gunshot fractures of the skull, the patients recovered and were returned to duty at intervals at from one to twenty months, the average period of treatment in hospital being seven and one-half months. All but two of the patients were under thirty years of age, and a majority between seventeen and twenty-five years of age. In all of the cases, the fractures were on the upper and anterior, or else on the superior lateral portions of the cranium:

ALGER, JOSEPH F., Private, Co. B, 35th Iowa, aged 17 years. Pleasant Hill, April 9th, 1864. Fracture at vertex by conoidal musket ball. Gayoso Hospital, Memphis. Two fragments of bone removed. Duty, June 2d, 1864.

ANDERSON, SAMUEL, Private, Co. E, 11th Pennsylvania, aged 18 years. Wilderness, May 6th, 1864. Frontal fractured by conoidal ball. Mount Pleasant Hospital, Washington. In May, fragments of both tables removed. Duty, August 20th, 1864.

FELLOWS, SAMUEL, Private, Co. A, 27th Indiana, aged 22 years. Gettysburg, July 3d, 1863. Fracture of right parietal by conoidal ball. Mower Hospital. August 6th and 9th, necrosed bone removed. Duty, May 3d, 1864.

FOSTER, CALEB R., Private, Co. B, 102d Pennsylvania, aged 17 years. Wilderness, May 5th, 1864. Fracture at vertex by conoidal ball. Finley and Satterlee Hospitals. Fragments of external table removed June 17th. Duty, March 17th, 1865.

HALLOCK, HENRY S., Private, Co. F, 24th Iowa. Port Gibson, May 1st, 1863. Gunshot fracture of left parietal. Union Hospital, Memphis. Removal of fragments, July 1st. Duty, August 30th, 1863.

LAPORTE, ZEPHANIAH, Private, Co. F, 23d Ohio, aged 27 years. Antietam, September 17th, 1862. Fracture of frontal by conoidal ball. Frederick and Baltimore hospitals. Removal of fragments. Retained in hospital as nurse. Duty, May 16th, 1864.

MCCANN, R., Quartermaster Sergeant, 1st Louisiana Union Volunteers. Port Hudson, June 14th, 1863. Gunshot fracture of left parietal. Regimental hospital. January 12th, 1865, removal of large piece of parietal bone through crucial incision. Duty, February 3d, 1865.

PELLES, JAMES W., Private, Co. G, 156th New York, aged 25 years. Winchester, September 19th, 1864. Gunshot fracture of parietal bone by conoidal ball. Sandy Hook and York hospitals. Fragments of inner table removed, October 5th, 1864. Duty, December 14th, 1864.

RIMER, LEVI, Private, Co. A, 143d Pennsylvania, aged 19 years. Petersburg, June 17th, 1864. Fracture of cranium at vertex by conoidal musket ball. New York and Philadelphia hospitals. Several fragments of bone removed. Duty, February 15th, 1865.

ROONEY, MARTIN, Corporal, Co. A, 119th New York, aged 23 years. Lost Mountain, June 15th, 1864. Fracture of temporal bone by conoidal musket ball. Chattanooga, Nashville, and New York hospitals. August 12th and 27th, four large fragments of bone removed by incision. Duty, November 21st, 1864.

SEARS, DAVID T., Private, Co. C, 116th Ohio, aged 35 years. Winchester, September 19th, 1864. Gunshot fracture of cranium. Field and Frederick hospitals. Fragments of loose bone removed. Duty, November 23d, 1864.

SHINN, FRANKLIN, Private, Co. H, 23d New Jersey, aged 21 years. Fredericksburg, December 13th, 1862. Fracture of parietal bone by shell. Harewood and Satterlee Hospitals. A thin shell of bone removed, February 13th, 1863. Duty, June 2d, 1863.

STYLES, GEORGE M., Sergeant, Co. K, 98th Pennsylvania, aged 29 years. Gettysburg, July 2d, 1863. Slight fracture of left parietal bone by conoidal musket ball. Baltimore, Annapolis, and Philadelphia hospitals. Removal of necrosed bone through crucial incision and by an elevator, January 18th, 1864. Duty, March 10th, 1864.

WILLIAMS, THOMAS, Corporal, Co. E, 162d New York Volunteers, aged 32 years. Cane River, Louisiana, April 23d, 1864. Gunshot fracture of right parietal. Baton Rouge Hospital. Fragment of external table removed May 30th, 1864. Duty, August 27th, 1864.

WOOD, THOMAS L., Private, Co. G, 2d New York Heavy Artillery, aged 18 years. Petersburg, June 16th, 1864. Fracture of left parietal by conoidal musket ball. City Point and New York Hospitals. Fragments of bone and ball removed. Duty, March 2d, 1865.

YOCUM, HENRY, Private, Co. C, 150th Pennsylvania, aged 24 years. Gettysburg, July 2d, 1863. Gunshot fracture of frontal bone by conoidal musket ball. Harewood and Satterlee Hospitals. Fragments of bone from both tables removed. Duty, January 25th, 1864.

In the eleven following cases, belonging to the class under consideration, the patients were sent to modified duty in hospital or garrison; but their physical disabilities ultimately compelled their discharge and admission to the Pension List. Nearly all were young soldiers, the ages ranging from seventeen to twenty-seven years. The fractures were of the upper frontal, temporal, or parietal regions, except in the instance of one fracture of the occipital. The fractures were produced by conoidal balls in nine, and by shell fragments in two, of this series of cases. The average duration of hospital treatment was about six months:

DOWTY, ABNER S., Private, Co. B, 33d Massachusetts, aged 20 years. Resaca, May 15th, 1864. Fracture of left parietal by conoidal ball. Nashville and Louisville hospitals. Duty, September 9th, 1864. Discharged June 11th, 1865. Examiner Foster Hooper, M. D., reports, May 21st, 1869, that a number of pieces of bone have been removed, leaving a large cicatrix, much depressed, and that the man is subject to fits and headache.

DOYLE, JAMES, Private, Co. M, 24th New York Cavalry, aged 23 years. Cold Harbor, Virginia, June 1st, 1864. Fracture of left parietal bone by conoidal musket ball. Washington and Philadelphia hospitals. Duty, February 7th, 1865. Mustered out July 23d, 1865. Examiner H. W. Loomis, M. D., January 20th, 1866, states that several pieces of bone have been removed. The right arm is partially, and the right leg slightly, paralyzed. The vision of both eyes is impaired and he suffers from dizziness and pain.

GILLEM, EDWARD, Captain, Co. G, 158th New York, aged 26 years. Hatcher's Run, Virginia, March 29th, 1865. Fracture at vertex by conoidal ball. Point of Rocks and Fort Monroe hospitals. Duty, June 30th, 1865; discharged. Examiner James Neill, M. D., reports, August 2d, 1865, that a fragment of bone has been removed and that the pensioner is subject to hemiplegia and nervous irritability.

GOLDEN, PATRICK, Private, Co. D, 2d New York Heavy Artillery, aged 27 years. North Anna River, May 18th, 1864. Fracture of frontal bone, with extensive laceration by conoidal ball. Washington and Philadelphia hospitals. June 19th and 25th, removal of fragments of bone and ball. Duty, September 22d, 1864; discharged. Examiner H. B. Day, M. D., states that the sight of the left eye is imperfect. In September, 1869, the pensioner filed an application for an increase of pension.

HANCOCK, JOHN F., Private, Co. F, 25th Ohio, Chancellorsville, May 3d, 1863. Fracture of parietal bone by conoidal ball. Washington, Philadelphia, and Covington hospitals. Duty, December 1st, 1863; discharged July 26th, 1864. Examiner Julius Nichols, M. D., reports that pieces of bone have been removed, that the hearing is imperfect, and that the pensioner is subject to dizziness.

HAYS, JAMES, Corporal, Co. D, 87th New York, aged 23 years. Fair Oaks, May 31st, 1862. Fracture of temporal bone by conoidal ball. New York hospitals. Ten pieces of bone removed at different periods. Duty, February 26th, 1863; discharged March 27th, 1863. Examiner D. R. Good, M. D., reports, March 21st, 1864, that exfoliation is still going on, and that the man is suffering from incipient phthisis.

JOHNSON, WILLIAM J., Private, Co. A, 2d New York Mounted Rifles, aged 17 years. Petersburg, June 25th, 1864. Fracture of cranium, right side, by conoidal musket ball. Washington and Philadelphia hospitals. Removal of large fragment of bone. Duty, January 18th, 1865; discharged August 10th, 1865. Examiner J. H. Helmer, M. D., January 10th, 1867, states that the pensioner is suffering from phthisis pulmonalis, and that his disability is total.

Stickney, William H., Private, Co. B, 6th New Hampshire, aged 24 years. Petersburg, July 6th, 1864. Fracture of parietal bone at vertex by conoidal ball. City Point and Philadelphia hospitals. Removal of fragments of bone. Duty, October 17th, 1864; mustered out November 27th, 1864. Examiner Phineas Spalding, M. D., May 15th, 1866, states that the pensioner is afflicted with numbness and loss of action in arm, that he suffers almost constant pain in the head, and that his stomach is very irritable.

Sturdevant, Clark, Private, Co. E, 27th New York. Chancellorsville, May 3d, 1863. Fracture of cranium by shell. Treated in Washington hospitals. Removal of loose fragments of bone. Duty, August 11th, 1863; discharged May 31st, 1863. Examiner J. L. Stewart, M. D., states that exercise gives evidences of pressure on the brain.

McCain, William, Private, Co. D, 63d Pennsylvania. Gettysburg, July 2d, 1863. Fracture of cranium; portion of bone carried away by conoidal ball. Gettysburg, Harrisburg, and York hospitals. Duty, July 13th, 1864; discharged. Examiner A. B. Otto, M. D., reports, August 21st, 1865, that numerous pieces of bone have been removed; that the sight of the right eye is almost entirely destroyed, and the left sympathetically affected.

Smith, William P., Private, Co. B, 9th Vermont, aged 23 years. Newport Barracks, February 2d, 1864. Fracture of occipital bone. Morehead City and Burlington hospitals. March 26th, removal of piece of bone. Duty, August 1st, 1864; discharged. Examiner Cyrus Porter, M. D., September 16th, 1869, states that there is partial deafness, attended with dizziness and headache.

Nearly all of these patients suffered from vertigo, headache, or some disorder of the cerebral functions; one had epileptiform convulsions; three suffered from paralysis of some of the motor nerves; two were deaf; three had defective vision, and two were laboring under pulmonary phthisis at the date of the last report of the pension examiner.

Discharged and Pensioned.—Of the numerous cases reported of patients who recovered after fragments of bone, fractured by gunshot projectiles, had been removed, those cases in which the names of the patients remain on the Pension Roll will first be considered:

Case.—Private William Angus, Co. E, 173d New York Volunteers, aged 42 years, was wounded at Port Hudson, Louisiana, June 14th, 1863, by a conoidal ball, which comminuted and depressed the right parietal bone. He was conveyed to New Orleans, and entered University Hospital on June 17th. Assistant Surgeon P. S. Connor, U. S. A., removed nine fragments of bone from the wound. The fracture was situated immediately superior and anterior to the right parietal eminence, and was an inch and a half by three-fourths of an inch in extent, the dura mater being uninjured. The left side of the body became paralyzed. However, this disappeared a few days after the operation, and the patient so far recovered that he was placed on duty in the hospital as a nurse. On June 1st, 1864, he was transferred to the Central Park Hospital, New York, and on June 16th, 1864, he was discharged from the service. The wound of the scalp was then perfectly healed, with an hiatus in the bony covering of the brain one and one-fourth by three-fourths of an inch in extent, closed, apparently, by a tough membranous septum. The fragments removed are outlined in the adjacent wood-cut, (Fig. 112.) This patient was reported, in 1871, as pensioned because of mental imbecility and general debility.

Fig. 112.—Nine fragments removed from the right parietal bone after gunshot fracture. *Spec.* 2998, Sect. I, A. M. M.

Case.—Captain Winfield S. Barr, Co. B, 105th Pennsylvania Volunteers, aged 23 years, was wounded in an engagement before Petersburg, Virginia, August 16th, 1864, by a conoidal ball, which fractured the mastoid process of the temporal bone, and injured the base of the occipital. He was admitted to the hospital of the 3d division, Second Corps, and thence was sent to the Satterlee Hospital. On admission, August 20th, the patient was delirious, and the wound had an unhealthy aspect. On August 23d, hæmorrhage to the amount of eight ounces occurred from the posterior auricular and some of the small deep cervical branches. This bleeding was arrested by styptics, compress, and roller. On the following day hæmorrhage recurred, and about five ounces of blood was lost. From that time the case progressed favorably. On December 7th, several spiculæ of necrosed bone came away, and, on December 30th, a large portion of the mastoid process was removed. On January 19th, 1865, Captain Barr was transferred to the Officers' Hospital, Philadelphia, and thence mustered out of the service. On May 15th, 1865, he was a pensioner and his disability was rated as total and permanent.

Case.—Private Freeman Behymer, Co. A, 104th Ohio Volunteers, aged 37 years, was wounded at the battle of Franklin, Tennessee, November 29th, 1864, by a conoidal ball, which fractured the parietal and frontal bones at the junction of the sagittal and coronal sutures. He was admitted on the following day to hospital No. 8, Nashville, where he remained until December 9th, when he was transferred to the Joe Holt Hospital, Jeffersonville, Indiana. On December 20th, he was sent to the Camp

Dennison Hospital, Ohio. On May 6th, 1865, the parts had become inflamed, painful, and suppurating. The patient was chloroformed, when Surgeon Clark McDermont, U. S. V., made a slight incision through the integument, and removed a loose, irregular-shaped piece of dead bone two and a quarter inches long and two inches wide. Glycerine dressings were applied. The case progressed favorably, granulations being abundant and healthy, and on October 31st, 1865, the man was discharged from the service. A communication from the Commissioner of Pensions, dated July, 1868, states that Behymer is a pensioner, and that his disability is rated total and permanent.

Case.—Private Emanuel Brown, Co. I, 4th Rhode Island Volunteers, was wounded in an engagement near Petersburg, Virginia, July 30th, 1864, by a conoidal ball, which fractured the cranium. He was admitted into the field hospital of the 2d division, Ninth Army Corps, where fragments of bone were removed, and on August 5th he was transferred to Knight Hospital, New Haven, Connecticut, whence he was discharged from the service on October 26th, 1864, by reason of expiration of term of service. There is a water color drawing of the recent wound in the Army Medical Museum. In March, 1868, Brown was a pensioner, his disability being rated total and permanent. Pension Examiner Henry Wheaton Rivers, formerly Surgeon U. S. V., reported that there was an opening, closed by fibrous tissue, between the bones of the frontal and parietal regions, of an inch in width and about two inches in length. "He has pain, dizziness, defective vision, and deafness in left ear. The present disability is total and permanent. The disability is not caused by any fault of his own."

Case.—Second Lieutenant Isaac Branson, Co. E, 19th Indiana Volunteers, aged 28 years, was wounded at the battle of South Mountain, September 14th, 1862, by a round musket ball, which entered the mastoid portion of the left temporal bone about one and a half inches above and behind the meatus auditorius externus, and lodged. After remaining insensible for a few minutes, he attempted to rise, but being unable to control his limbs, he would constantly stumble and fall. He states that he introduced his little finger into the wound for more than an inch, and could feel the brain substance. Spiculæ of bone were removed. On September 15th, he was sent to the hospital at Frederick, and thence was transferred, on September 19th, to the Patent Office Hospital at Washington. The wound being very painful, he did not wish to have it probed, and therefore did not tell the attending surgeon that the ball remained in the wound. Simple dressings were applied. For several weeks he staggered and had fever, but never was delirious. Spiculæ of bone continued to come away for some weeks, but the wound healed gradually, and on October 3d the patient was sent to New York. He was afterward returned to his regiment, and mustered out on October 26th, 1864. He was examined on March 29th, 1866, by Dr. G. W. H. Kemper. A prominent scar marks the entrance of the ball, which, according to the patient's belief, remains in the cranium. He is subject to headache in the back part of the head. His intellect does not seem to be impaired. On October 7th, 1867, Pension Examiner J. C. Helm reports the patient as nearly unfit for any business, owing to vertigo, headache, and dizziness. He rates his disability as total and permanent.

Case.—Private Reuben Clark, Co. H, 31st Maine Volunteers, aged 21 years, was wounded at the battle of Petersburg, Virginia, April 2d, 1865, by a fragment of shell, which struck near the anterior superior angle of the right parietal bone, producing a fissure one and one-half inches in length, denuding the bone of the periosteum, and slightly depressing the external table. He was admitted into the general field hospital of the Ninth Army Corps on the same day, and a few days later sent to Washington, and admitted on the 5th into the Carver Hospital. On the 8th, the patient was transferred to the Mower Hospital at Philadelphia. Simple dressings were used. On the 13th, prominent cerebral symptoms, with pain in the head and high fever, were ushered in by a chill. Cathartics were administered, and cold water applied to the head. Small doses of calomel and opium were given for a few days afterward. Some small pieces of necrosed bone were subsequently removed. On June 15th, 1865, he was discharged the service. The case is reported by Acting Assistant Surgeon W. P. Moon. In August, 1866, Pension Examiner James C. Weston reports that this pensioner is sometimes subject to dizziness, especially on stooping, and that his eyes fill with tears when reading. His disability is rated one-half.

Case.—Private Edward W. Hawkins, Co. E, 28th U. S. Colored Troops, was wounded near the Chickahominy, Virginia, June 25th, 1864, by a conoidal ball, which apparently injured the scalp only. He was admitted on June 28th to L'Ouverture Hospital, Alexandria, and returned to duty July 18, 1864. On August 17th, he was admitted to Satterlee Hospital, where the case was diagnosticated a fracture of the cranium. The records also state that the patient's skull had been operated upon, at the time of injury, by the removal of detached fragments. He was suffering from chronic diarrhœa, which gradually amended under treatment. On September 29th, he was sent to Summit House Hospital; on March 29th to Beverly; and on May 12th to Whitehall, where he was discharged the service May 26th, 1865. On September 26th, 1868, Pension Examiner W. D. Thomas states that the patient complained of inability to labor because of vertigo and intense pain in the head. He rated his disability at one-half and temporary.

Case.—Lieutenant A. G. Williams, Co. E, 63d Pennsylvania Volunteers, received, at the battle of the Wilderness, Virginia, May 5th, 1864, a gunshot fracture, with depression of the frontal bone, left side; also a wound of the temple; the occipito-frontalis muscle was severed. He was admitted to the hospital of the 2d division, Sixth Corps, where the depressed portions of bone were removed; thence he was conveyed to Washington, D. C., and there attended in his quarters until May 18th, when he was furloughed. He reported at the Officers' Hospital at Annapolis, Maryland, on July 27th, and on August 9th was discharged from the service by reason of Special Order No. 261, A. G. O., August 6th, 1864. He subsequently made application for a pension, and was examined by G. McCook, examining surgeon for pensions, Pittsburg, Pennsylvania, who reported that the third pair of nerves were affected. His disability is rated at one-fourth and permanent.

Case.—Private Walter Wheeler, Co. B, 91st New York Volunteers, aged 37 years, was wounded before Petersburg, Virginia, April 1st, 1865, by a conoidal ball, which entered above the anterior zygomatic articulation, fractured and depressed the temporal bone, and emerged just above the external meatus, right side. He was conveyed to the depôt field hospital of the Fifth Army Corps, where he remained until the 18th, when he was sent to Washington, and admitted into the Harewood Hospital on the 19th. Three days later he had a slight hæmorrhage from the common temporal artery, which was ligated. The wounds

of entrance and of exit were communicated, when it was found that a small portion of bone at the point of exit was denuded of pericranium. Subsequently the denuded portion was removed. By June 17th Wheeler had fully recovered, and on June 29th, 1865, was discharged from the service. In July, 1868, he was a pensioner, his disability being rated as total and permanent. Photographs of the case will be found in Volume VII, Phot. Series A. M. M.

Case.—Corporal Ezra Scarborough, Co. G, 15th New Jersey Volunteers, aged 34 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a musket ball, which fractured and depressed a portion of both tables of the right parietal bone near the vertex. He was sent to a field hospital; thence to Washington, and was admitted into Stanton Hospital, May 8th. The left upper and lower extremities were paralyzed, except the fingers of the left hand, which could be slightly flexed. The paralysis was limited to the motor nerves, those of sensation being unaffected. He complained of headache, and there was some confusion of intellect, though no delirium. The pupils were contracted and symmetrical, but sluggish to stimulus of light. The skin was soft, moist, and natural in temperature. Water dressings and ice were applied to the wound, a saline purgative was administered, and low diet was ordered. The case progressed favorably, and on the 10th, the patient could flex the left elbow. The pupils were still contracted and sluggish, the pulse ranging from 65 to 70. By the 25th, the patient had recovered control of the left arm, though it was not yet as strong as the right; the pupils were still sluggish, but not contracted; the detached bone appeared elevated. On June 7th, a detached fragment of the inner table, one inch in length and half an inch in width, was removed by Surgeon John A. Lidell, U. S. V. It consisted of diploë and the vitreous table, and when removed, the dura mater and the pulsations of the brain were distinctly visible. The pupils had become natural in size, contracting readily under the stimulus of light; the wound suppurated freely and looked healthy, having slightly contracted. The applications of ice were now discontinued. On the 12th, the pulse had risen from 65 to 80; paralysis of left leg had diminished in a marked degree. June 24th, paralysis was still diminishing, but the patient still complained of headache induced by constipation. July 8th, the brain pulsations were no longer visible, the patient was able to leave his bed, and on August 1st, could walk with the aid of a cane. He continued to improve rapidly, and on the 17th, had recovered sufficiently to go home on furlough. He was transferred to Ward Hospital, Newark, New Jersey, on November 13th, 1863, and was discharged the service on December 11th, 1863, and pensioned. On June 6th, 1866, Pension Examiner E. Swift reports that a deep depression existed over the original seat of injury. There was paralysis of the left side, more marked in the leg than in the arm. The limbs were atrophied and weak, although they preserved their natural movements. The patient suffered a great deal from headache and from severe pain in the affected limbs. His speech was much impaired, and he was unable to do manual labor. His disability was then rated total and permanent. A communication from the Commissioner of Pensions, dated January 3d, 1868, states that Scarborough was a pensioner, his disability being rated total and temporary.

Fig. 113.—Fragment removed from right parietal after gunshot fracture. *Spec.* 1666, Sect. I, A. M. M.

Case.—Sergeant William Dougherty, Co. G, 101st Pennsylvania Volunteers, aged 34 years, was wounded at Plymouth, North Carolina, April 20th, 1864, by a conoidal ball, which fractured the left parietal. A portion of the bone, two inches in length and one inch in breadth, was subsequently extracted, leaving the dura mater exposed. He was taken prisoner, and upon being exchanged was sent to Annapolis, entering the 1st division hospital on October 20th, 1864, suffering from partial hemiplegia. He was furloughed on the 4th of November, and, at the expiration of his leave, November 22d, entered the hospital at Pittsburg, Pennsylvania, where he was discharged the service on February 10th, 1865. He subsequently applied for a pension, and was examined by Dr. G. McCook, Examining Surgeon for Pensions, Pittsburg, Pennsylvania, who reports that there were substantial granulations from the dura mater. In 1868, Dougherty was a pensioner, his disability being rated total and temporary. On July 28th, 1869, Pension Examiner P. B. Rice reports partial paralysis of the left side, and rates his disability permanent.

Case.—Private Horace G. Conant, Co. D, 1st Ohio Volunteers, aged 21 years, was wounded at Mission Ridge, Tennessee, November 25th, 1863, by a shell, which fractured the occipital bone. He was conveyed to Chattanooga, Tennessee, and admitted to Hospital No. 5, on the 6th of December. Furloughed on the 26th of January, he was, on his return, March 25th, admitted to the hospital at Cleveland, Ohio, and discharged the service on the 24th of June, 1864. A portion of the external table of the occipital bone had been removed, but the place and date of the operation are not ascertained. On May 5th, 1865, Pension Examiner D. F. Alsdorf reported both tables of the bone absent, and the wound but recently closed. Active exercise causes severe pain over the right eye and dull pain at the seat of injury. The left arm is paralyzed. He rates his disability three-fourths and temporary.

Case.—Private Josiah Reed, Co. F, 148th New York Volunteers, aged 39 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal ball, which fractured and depressed the posterior superior angle of the right parietal bone. He was admitted to the field hospital, Eighteenth Corps, on the same day; sent to St. Paul's Church Hospital, Alexandria, Virginia, on the 8th, and thence transferred to the Cuyler Hospital, Germantown, Pennsylvania, on the 13th. He suffered from headache without stupor or delirium; partial paralysis of the left foot and leg existed, and the tongue was drawn toward the left side. These symptoms continued without any change, except a gradual diminution of the paralysis until the beginning of July, when increased dullness and hebetude and a decided icteroid tinge over the whole body, rendered the prognosis more serious. On July 2d, the soft parts were divided, the seat of fracture exposed and all sequestra removed. One spicula measured an inch in length by half an inch in width, involving both tables. Considerable fetid pus flowed from the wound. The dura mater was covered with healthy granulations. The patient was kept in bed with his head elevated; cold applications were made to the wound, and an occasional mercurial and saline cathartic was administered. By September 30th, the wound had entirely healed. No cerebral symptoms appeared during the treatment. On May 10th, 1865, he was sent to the Mower Hospital, Philadelphia, and on the 16th, was transferred to the Veteran Reserve Corps. The case is reported by Assistant Surgeon H. S. Schell, U. S. A. This soldier was discharged the service July 10th, 1865, and pensioned. On February 13th, 1866, Pension Examiner R. C. Bordwell reports that the man suffered from partial hemiplegia of the left side, with confusion of ideas, loss of memory, etc. He rated his disability one-half and temporary.

CASE.—Private James H. Quimby, Battery L, 1st Maine Heavy Artillery, aged 21 years, was wounded at Spottsylvania Court-house, May 19th, 1864, by a conoidal musket ball, which penetrated the outer table of the left temporal bone, passed downward and chipped off a portion of the mastoid process. Another ball entered beneath the left clavicle, injuring the apex of the left lung, and passed out at the axilla. He remained on the battle-field three days without attendance; was then removed to Fredericksburg, Virginia; thence sent to the Columbian Hospital at Washington on May 28th, and was furloughed June 12th, 1864. He was treated at his home by Pension Examiner E. Russell. Simple dressings and expectant treatment were used. On July 23d, a piece of the outer table of the temporal bone, about three-fourths by one-half inch in size, was removed. After the operation, the patient slowly recovered. On August 4th, 1864, he was admitted to the Cony Hospital at Augusta, Maine; on February 18th, 1865, was transferred to the Veteran Reserve Corps; and on June 10th, 1865, was discharged the service and pensioned. At this date the wound had healed, but active exercise caused dyspnœa. Subsequent information from Pension Examiner J. B. Bell states that the patient suffered from deafness, headache, vertigo, and paralysis of arm. He was unable to bear exposure to heat. His disability is rated total and permanent.

CASE.—Sergeant Allen C. Taylor, Co. B, 7th New Hampshire Volunteers, aged 23 years, was wounded before Petersburg, Virginia, May 9th, 1864, by a conoidal musket ball, which struck the left parietal bone, passed backward parallel with the sagittal suture, produced a furrow in the scalp of four or five inches in length, and involved the bone for the same distance. He was admitted to the Hampton Hospital on May 11th, and, in a few days, sent by steamer to the Central Park Hospital, New York, where he arrived on the 23d of the month. The wound was ragged in appearance and tumefied; the bone was bared and burrowed. There was no evidence of compression, and the pulse was full. On the 27th, the tumefaction had involved the right eye, and a sluggish movement of the pupils was observed, the patient feeling dull. The wound all this time was painful and emitting an unhealthy discharge. Upon a thorough examination of the parts, pieces of the missile were found impacted in the outer table. Poultices were now applied to the head, and on June 17th Acting Assistant Surgeon George F. Shrady removed an irregular depressed portion of the external table, which had become detached, measuring three-fourths of an inch by one and a half inches. Three days later, a portion of the vitreous table, one-half by three-fourths of an inch, came away. On the 25th, again several fragments of the outer table were removed, and on the 5th of July another portion of the inner table, in which was imbedded a good-sized piece of the missile. Spiculæ of bone and pieces of lead were afterward extracted at different periods. The patient experienced a good deal of pain in the head, and the occurrence of a fungus cerebri was apprehended, the pulsations of the brain being visible. The dura mater was uninjured, and the discharge from the wound was free and healthy. The patient recovered rapidly, and was discharged from service on November 21st, 1864, being, at the time, in the full possession of his mental powers and a good degree of strength. The case is reported by Surgeon B. A. Clements, U. S. A. In 1869 Taylor was a pensioner, his disability being rated at three-fourths. Pension Examiner W. D. Buck reports that this pensioner has partial paralysis of the *left* arm, and vertigo, and that there is a depression half an inch deep at the upper anterior angle of the left parietal.

CASE.—Private M. R. Armour, Co. E, 83d Pennsylvania Volunteers, was wounded at the battle of Gaines' Mill, Virginia, June 27th, 1862, by a conoidal ball, which fractured the right parietal bone. He remained in the field hospital until July 29th, when he was sent to Chester, Pennsylvania, and thence, on September 18th, to the Sixteenth and Filbert Streets Hospital, Philadelphia. Acting Assistant Surgeon L. Fassitt removed a portion of the fractured bone about one inch long and one-third of an inch wide. Simple dressings were applied to the wound. The patient recovered, and was discharged from service on November 26th, 1862. He could not bear exposure to the sun, and his left hand was partially paralyzed. The Commissioner of Pensions states that in March, 1863, Armour's disability was rated "one-half and temporary". The case is reported by Acting Assistant Surgeon Richard J. Dunglison.

CASE.—Private David K. Pillsbury, Co. E, 12th New Hampshire Volunteers, received, at the battle of Chancellorsville, Virginia, May 3d, 1863, a gunshot fracture of the left parietal bone at its posterior superior aspect. He was admitted to field hospital Third Corps; on June 14th, sent to 1st division hospital, Alexandria; and on June 19th, to Satterlee Hospital, Philadelphia. There was constant cephalalgia and dizziness. A piece of bone from the outer table, three-fourths by three-eighths of an inch, was detached. On July 28th, the patient was sent to Concord, New Hampshire. Bone had exfoliated; headache, nausea, and partial paralysis of arms and legs existed, and the patient was greatly enfeebled. He was discharged September 4th, 1863, and pensioned, his disability being rated three-fourths and doubtful.

CASE.—Private Adam W. Zimmerman, Co. B, 184th Pennsylvania Volunteers, aged 30 years, was wounded at the battle of Petersburg, Virginia, June 22d, 1864, upon the left side of the head, near the sagittal suture, by a conoidal musket ball, which passed directly backward, tearing up the scalp and fracturing the parietal bone. He was immediately admitted to the hospital of the Second Corps, and thence conveyed to Alexandria, and admitted on July 4th into the 2d division hospital. On July 13th, he was transferred to the Broad and Cherry Streets Hospital at Philadelphia. Soon after, a fragment of bone, measuring one and one-fourth inches in length by three-fourths in width, was removed. On July 18th, he was sent to the Summit House Hospital, and thence, on August 24th, transferred to the Satterlee Hospital, where, on October 20th, another piece of bone of nearly the same size, including a portion of the inner table three-fourths of an inch in diameter, was removed. An extensive incision of the scalp was now made to secure a ready discharge of pus. Other small scales of bone were removed as they became detached; otherwise the case progressed satisfactorily. The wound had fully cicatrized by the middle of March, 1865, and the patient was discharged from service on May 6th, 1865. The case is reported by Surgeon Isaac I. Hays, U. S. V. In 1869, he was a pensioner, his disability being rated permanent. The right arm and leg were partially paralyzed.

CASE.—Sergeant James W. Coaltrap, Co. G, 174th Ohio Volunteers, aged 29 years, was wounded near Murfreesboro', Tennessee, December 7th, 1864, by a shell, which lacerated the scalp over the frontal bone. He was admitted to hospital at Murfreesboro', and in February, 1865, sent to Harewood Hospital, Washington, where he was discharged the service June 22d,

1865, and was afterward pensioned. On May 3d, 1869, Pension Examiner J. M. Todd reported this man to be suffering from constant severe headache, with a marked nervous irritation, insomnia, violent vertigo, partial paralysis, and mental obtuseness—all of which symptoms were on the increase.

Case.—Corporal Henry Sweiger, Co. I, 208th Pennsylvania Volunteers, aged 18 years, received, near Petersburg, Virginia, March 25th, 1865, a gunshot fracture of the right parietal bone. He was sent to the hospital of the 3d division, Ninth Corps; thence to Washington, where he was admitted to the Lincoln Hospital on March 30th. On May, 13th, he was transferred to the Mower Hospital, Philadelphia. Simple dressings were applied to the wound. On June 1st, an exfoliation of the outer table, three-fourths of an inch in length by one-half inch in width, was removed, and two days later another piece, one inch in length, was taken out. No untoward symptoms followed, and the patient was discharged the service on June 21st, 1865, and pensioned. On March 26th, 1868, Pension Examiner M. H. Strickler, reported this man to be suffering from partial paralysis of the left side, and to be unable to perform manual labor or bear exposure to the sun. He recommends an increase of pension.

Case.—Private William Coneley, Co. H, 14th Illinois Volunteers, was wounded at the battle of Shiloh, Tennessee, April 6th, 1862, by a musket ball, which fractured the centre of the left parietal bone. The ball and several long spiculæ of bone were removed from the wound. He was probably treated in a field hospital until July 10th, 1862, when he was admitted to the hospital at Keokuk, Iowa. He was discharged on October 17th, 1862, and was subsequently pensioned. On May 19th, 1863, Pension Examiner T. S. Hening reports that the paralysis of the right arm, occurring immediately after the removal of the ball and fragments, still continues. He rates the patient's disability total and temporary.

Case.—Private Hugh Finnegan, Co. A, 4th Rhode Island Volunteers, aged 35 years, was wounded near Petersburg, Virginia, July 30th, 1864, by a conoidal ball, which fractured the upper part of the left parietal bone. He was admitted to the hospital of the 2d division, Ninth Corps; on August 3d, sent to hospital of the Ninth Corps at City Point; and, on August 6th, to Lovell Hospital, Portsmouth, Rhode Island. He was discharged on June 1st, 1865, and pensioned, his disability being rated at two-thirds. There was headache, dizziness, and partial paralysis of right arm. A portion of the temporal bone had been removed, but at what time cannot be definitely ascertained. On March 11th, 1867, Pension Examiner R. W. Rims reported this man to be totally deaf in the left ear, and suffering almost constant pain, with vertigo. There is also paralysis of the right hand and arm.

In the following curious case, paraplegia, relieved by the removal of the missile and depressed fragments from a depressed fracture of the parietal, was followed by hemiplegia, first of the right and then of the left side:

Case.—Private David C. Minium, Co. F, 49th, Pennsylvania Volunteers, aged 26 years, was wounded at the battle of Winchester, Virginia, September 19th, 1864, by a spent ball, which fractured and depressed the *left* parietal bone at the top of the head to the extent of one inch in diameter, and then lodged in the wound. He was conveyed to the hospital of the 1st division, Sixth Corps, and on September 25th, sent to the hospital at Sandy Hook, Maryland. On October 3d, half of the ball and several fragments of bone were removed by Acting Assistant Surgeon J. F. Bartholf, relieving immediately the paralysis of the lower extremities, which had existed before the operation. He recovered and was discharged on July 24th, 1865. At this date, Acting Assistant Surgeon Thomas H. Helsey reported that there was partial paralysis of the right side of the body, with frequent attacks of headache and vertigo. On May 31st, 1866, Pension Examiner T. C. Morris reported that there was a deep depression of the skull, "causing a partial paralysis of the entire *left* side."

Epilepsy.—Many patients who recovered after gunshot fractures of the skull, treated by the removal of detached or depressed fragments of bone, suffered, ultimately, from epilepsy. Abstracts will be given of a few of these cases:

Case.—Private Benjamin K. Gardner, Co. B, 76th Pennsylvania Volunteers, aged 18 years, was wounded in front of Petersburg, Virginia, July 27th, 1864, by a conoidal musket ball, which slightly fractured the cranium. He was at once admitted to the hospital of the 2d division, Tenth Corps, sent to the general hospital at Fort Monroe on August 1st, and thence, on August 7th, by steamer to the De Camp Hospital in New York Harbor. He was furloughed on August 11th. On reaching home he became unconscious, and remained so for a period of five weeks. On November 19th, he was admitted into the Satterlee Hospital, at Philadelphia, where, on the 22d, several spiculæ of bone were removed, one of them measuring one by one-fourth of an inch. During the progress of the case several other spiculæ were removed, the last being extracted in January, 1865. The wound afterward healed rapidly, but the patient continued to suffer from headache until the day of his discharge from service, May 16th, 1865. The Commissioner of Pensions states in a letter dated March, 1868, that Gardner receives a pension of eight dollars per month, his disability being rated total and doubtful. On January 11th, 1869, Pension Examiner D. D. Mahon rates this man's disability total, of the third grade, and recommends an increase of pension, owing to the presence of epilepsy, partial paralysis of the limbs, and threatening amaurosis.

Case.—Sergeant Daniel W. Hayden, Co. H, 7th New Hampshire Volunteers, aged 23 years, was wounded at the battle of Olustee, Florida, February 20th, 1864, by a shell, which fractured and depressed the left parietal bone. He was sent to Jacksonville, Florida, and transferred to Hilton Head, South Carolina, on February 25th. The depressed bone had been elevated, and blood extravasated within the cranium had been removed before his admission. Simple dressings were applied. The patient recovered rapidly and was discharged from the service on the 28th of April, 1864. In March, 1868, his disability was rated at three-fourths and permanent. On January 29th, 1870, Pension Examiner J. F. Titts reported the disability as

total. A square inch of the parietal was gone, part having been removed by operation, and the rest having exfoliated. The cicatrix was painful, the pain being much increased by pressure. Frequent epileptic fits recurred, brought on by even slight fatigue or excitement. The convulsions have increased rather than diminished in intensity as time has worn on. The pensioner feared to leave home unaccompanied. Ultimate ruin of the mental powers was apprehended by the examiner.

CASE.—Private John P. Patterson, Co. A, 49th Pennsylvania Volunteers, aged 19 years, was wounded at Rappahannock Station, Virginia, November 7th, 1863, by a conoidal ball, which fractured and depressed both tables of the left parietal bone near the vertex. He was conveyed to Washington, and admitted into the Stanton Hospital on the 9th. Several fragments of bone were removed exposing the dura mater. For two days convulsions occurred; after that the patient became tranquil, with the loss of voluntary motion in the right arm and leg. On the 20th, the paralysis disappeared. The wound suppurated moderately and filled with healthy granulations. On the 26th, and again on the 27th of December, several small spiculæ of bone were removed. By January 1st, 1864, the patient had entirely recovered; was furloughed on the 7th, and admitted to Turner's Lane Hospital, Philadelphia, on May 11th. Epilepsy supervened, and he was discharged from the service on July 18th, 1864. A communication from the Commissioner of Pensions, dated January 2d, 1868, states that Patterson is a pensioner, and that his disability is rated total and permanent. The case is reported by Acting Assistant Surgeon C. Campbell.

CASE.—Private James McEvoy, Co. F, 28th Massachusetts Volunteers, aged 32 years, was wounded at the battle of Chantilly, Virginia, September 1st, 1862, by a fragment of shell, which struck the right parietal bone about an inch above the squamous portion of the temporal bone, fracturing both tables, and denuded the parietal for a space of three and a half inches in length by one and a half inches in width. Leaving the battle-field without assistance, he was admitted into the Emory Hospital at Washington, on the following day, where Surgeon William Clendenin, U. S. V., removed all loose spiculæ of bone. Profuse hæmorrhage from the meningeal artery was arrested by the application of ice. Cold water dressings were applied and morphia administered. On the 8th, the pupils were dilated, and the left arm was partially paralyzed, but the patient was perfectly rational. On the 14th, a piece of bone, one and one-fourth by three-fourths of an inch, was removed. Water dressings were discontinued, and cerate dressings were substituted. Mineral tonics, cathartics, and nourishing diet were ordered. On the 28th, the wound was discharging but a small amount of pus, and the patient was able, with some effort, to close his hand, but had no further use of it. By the 8th of October, the wound was nearly healed; a small surface, covered by healthy granulations, covered the brain. The pupils were still dilated, but, with the exception of his palsied arm, the patient was doing well. On November 11th, 1862, he was discharged the service and was pensioned. The case is reported by Surgeon W. Clendenin, U. S. V. On February 4th, 1867, Pension Examiner H. B. Hubbard reports the patient subject to frequent epileptic fits, and rates his disability total and permanent.

CASE.—Corporal George W. Monk, Co. A, 78th New York Volunteers, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball, which fractured the right parietal bone near its posterior superior angle. He fell to the ground in a state of insensibility; when consciousness returned he passed his finger into the wound one or two inches. His left arm and both of his legs were paralyzed. He remained on the field for three days, exposed to a cold and drenching rain without shelter, and was then seized with convulsions. He was admitted to the Log Hospital on May 6th, and on June 15th, sent to the Armory Square Hospital, Washington. From time to time, fragments of bone from both tables escaped. About the end of June, hæmorrhage occurred, probably from the middle meningeal artery, but was arrested by plugging. It recurred about four weeks later, but was again arrested. On August 27th he was furloughed; on October 14th, admitted to the Ladies' Home Hospital, New York, and on February 6th, 1864, discharged from service. The paralysis had disappeared entirely, except from his left arm, where it remained in a slight degree. On March 26th, 1868, Pension Examiner N. W. Leighton reports that the patient was a helpless epileptic. There was abscess of the brain and paralysis of the left arm, with morbid excitability of the whole cutaneous surface. He rates his disability total and permanent.

CASE.—Corporal James C. McClusky, Co. D, 115th Pennsylvania Volunteers, aged 56 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a conoidal musket ball, which produced a comminuted fracture of both tables of the frontal bone, right side, and lodged. The missile and a portion of the *os frontis*, an inch in diameter, which was pressing upon the brain, were removed three days subsequently in the field hospital. He was sent to the Harewood Hospital, Washington, on the 15th, where he remained until the 23d, when he was transferred to the Satterlee Hospital in Philadelphia. For a while he improved steadily, but about the 1st of August, began to sink into a state of insensibility, in which he remained several days. He rallied, however, made a rapid recovery and was discharged from service on the 23d of October, 1863. In January, 1868, his disability was rated total and permanent. The case is reported by Surgeon I. I. Hayes, U. S. V. On January 27th, 1864, Pension Examiner John Lowman reports this man to be subject to epilepsy, and rates his disability total and permanent.

CASE.—Private John Hurt, Co. E, 83d Indiana Volunteers, was wounded near Vicksburg, Mississippi, December 28th, 1862, by a fragment of shell, which fractured the frontal bone over the right eye. Fragments of bone were removed by Surgeon E. Andrews, 1st Illinois Light Artillery. He was conveyed to the Hospital Steamer City of Memphis, and thence, on January 13th, 1863, transferred to Paducah, Kentucky. He was discharged the service on March 23d, 1863, and was subsequently pensioned. On August 7th, 1868, Pension Examiner J. C. Burt reports that this man, in addition to a depression of the skull and the loss of an eye, suffers from pain in the head, and alleges that he has attacks simulating epilepsy. He rates his disability permanent.

CASE.—Private Columbus Custer, Co. C, 16th Iowa Volunteers, aged 33 years, was wounded at Atlanta, Georgia, July 22d, 1864, by a piece of shell, which fractured the parietal bone. He was admitted to a hospital at Chattanooga, on November 28th; sent, via Nashville, Tennessee, to the Jefferson Hospital at Jeffersonville, Indiana, where he was admitted on December 1st, 1864. The wound had entirely healed. The patient was discharged on April 4th, 1865. On January 4th, 1866, Pension

Examiner R. S. Lewis reports this man to be suffering from partial paralysis of the right side, and from epileptic fits, which occur once or twice monthly. He rates his disability total and temporary. A communication from the Commissioner of Pensions, dated July, 1868, states that Custer is a pensioner at $8 per month, his disability being rated total and temporary.

CASE.—Private Joseph Link, 19th New York Independent Battery, aged 24 years, was wounded at Spottsylvania Court-house, Virginia, May 12th, 1864, by a shell, which fractured the frontal bone, right side, half an inch above the superciliary ridge; fragments of inner table were imbedded in the membranes above the frontal sinus. Inflammation and compression followed and fragments of both tables were removed by forceps and elevator. He was discharged May 2d, 1865, and was subsequently pensioned. On October 17th, 1866, Pension Examiner J. H. Helmers reports a small piece of bone to be still denuded. There was a slight discharge from the wound, and the patient was subject to frequent attacks of epilepsy. He rates his disability total.

CASE.—Private James W. Hotchkiss, 19th New York Battery, was wounded in the engagement before Petersburg, Virginia, November 9th, 1864, by a musket ball, which fractured the cranium. He was admitted to the hospital of the 1st division, Ninth Corps; on November 13th, sent to the depot field hospital at City Point, and on November 29th, transferred to 3d division hospital at Alexandria. He was discharged from the service on April 3d, 1865, on account of fracture of skull and partial paralysis, and was afterward pensioned. On January 25th, 1868, Pension Examiner J. H. Helmers reported this man to be suffering from partial paralysis of the left side, with loss of memory. He also credits the patient's statement of being subjeet to frequent and severe epileptic fits. He rated his disability equivalent to the loss of a foot or hand and permanent.

Defective Vision.—In those patients who recovered after gunshot fractures of the skull, treated by removal of fragments, partial or complete loss of vision was one of the most frequent of the remote results.

CASE.—Private Adam Cornwall, Co. B, 91st Pennsylvania Volunteers, aged 21 years, was wounded at the battle of Cold Harbor, Virginia, June 21st, 1864, by a piece of shell, which struck the outer angle of the orbital ridge, fractured the orbital plate, and partially destroyed the sight of the right eye. He was at once admitted to the hospital of the Fifth Corps; on the 10th, sent to Sickle branch of the 2d division hospital at Alexandria, Virginia; and on the 20th transferred to Philadelphia, entering Satterlee Hospital on the 25th. On June 28th, Acting Assistant Surgeon Ezra Dyer removed two pieces of the orbital ridge. The patient's constitutional condition at this time was excellent, but there was some cerebral irritation. On July 1st, an incision in the scalp was made, and two pieces of bone were removed; one the size of a filbert, the other as large as a pea. Simple antiphlogistic treatment was employed, and the patient progressed finely. On April 13th, 1865, he was discharged from the service by reason of loss of sight of the right eye. A communication from the Commissioner of Pensions, dated March 26th, 1868, states that Adam Cornwall is a pensioner, and that his disability is rated at one-half and permanent. Examining Surgeon J. Cumminskey reports that the vision of the right eye is totally destroyed, but that the left eye is unaffected.

CASE.—Private Louis Dubar, Co. K, 12th Maine Volunteers, aged 21 years, was wounded at the battle of Cedar Creek, Virginia, October 19th, 1864, by a conoidal ball, which fractured and depressed the middle of the frontal bone. The fracture extended backward a distance of four inches. He was taken to a field hospital, and thence sent to Philadelphia, where he was admitted into Satterlee Hospital on the 23d, suffering much pain. Simple dressings were applied, and low diet ordered. On November 10th, coma supervened, and the right upper extremity became paralyzed. An examination revealed the edges of the bone depressed, and several small pieces lying loose between them. The fragments were removed, and the depressed portions elevated, revealing the dura mater intact. He improved at once, and in five days was able to walk about the ward free from any symptoms of nervous disorder. On May 20th, 1865, he was discharged from the service by reason of impaired vision. The case is reported by Surgeon I. I. Hayes, U. S. V. Pension Examining Surgeon H. Lenox Hodge reports that this pensioner is suffering from giddiness and faintness, and that the vision of the left eye is much impaired.

CASE.—Private Jerome Dickerson, Co. B, 179th New York Volunteers, was wounded in the engagement near the Weldon Railroad, Virginia, June 17th, 1864, by a conoidal ball. He was at once admitted to the hospital of the 1st division, Ninth Corps, and on July 1st was sent to the Mount Pleasant Hospital, Washington. The injury was treated as a slight scalp wound, and on July 20th the patient was sent to Mower Hospital, Philadelphia, where it was discovered that the frontal bone was fractured near its eminence. Small pieces of bone were removed at various times. He recovered, was returned to duty on December 5th, 1864, and discharged the service June 8th, 1865, and pensioned. On April 2d, 1866, Pension Examiner H. W. Nye stated that the patient suffers from pain, giddiness, and partial loss of sight of right eye. The patient also deposed that he was unable to labor in the summer, on account of dizziness and frequent pain in the head.

CASE.—Private James W. Duncan, Co. B, 10th West Virginia Infantry, aged 19 years, was wounded at Ashby's Gap, Virginia, July 18th, 1864, by the explosion of a caisson, causing depressed fracture of both tables of the superior portion of the frontal bone, a little to the right of the median line. He was admitted to the general hospital at Sandy Hook, Maryland, on the 22d, and was transferred to the hospital at Frederick on the 27th, suffering from headache and pain in the chest. Assistant Surgeon R. F. Wier, U. S. A., removed the depressed fragments to the extent of two and a half inches with bone-cutting forceps. No cerebral symptoms existed at the time. The injury to the head healed well, but the patient suffered for some time from empyema and pneumothorax. He recovered, was transferred to the hospital at Grafton, West Virginia, on January 31st, 1865, and discharged the service on June 5th, 1865. A communication from the Commissioner of Pensions, of March 26th, 1868, states that Private Duncan is a pensioner, his disability being rated as total and permanent. The other facts in the case were reported by Surgeon S. N. Sherman, U. S. V. On March 12th, 1869, Pension Examiner Thomas Kenney states that this man is totally blind in the left eye. Exercise or stooping produced total blindness. He rates his disability total and permanent.

CASE.—Private George W. Eastlick, Co. C., 29th Ohio Volunteers, aged 30 years, was wounded at the battle of Port Republic, Virginia, June 9th, 1862, by a conoidal ball, which fractured and depressed the cranium at the left parietal eminence. He was rendered insensible by the blow, and remained in that state for about four hours, when he recovered sufficiently to leave the field. The ball, which had fractured both tables of the skull and split upon the sharp edge of the outer table for two-thirds of its length, was readily removed on the field. On June 15th, he was admitted into Cliffburne Hospital, Washington. His general condition was good, but there was considerable mental confusion, loss of memory, marked deficiency in the strength and sensibility of the right arm, slight but persistent and daily increasing contraction of the fingers. The wound looked healthy and was granulating. Absolute quiet was enjoined, and laxation and light diet ordered; but the unfavorable symptoms evidently increased. On June 23d, ether was administered, and Assistant Surgeon John S. Billings, U. S. A., made a crucial incision over the seat of injury, cut away a small portion of the sound bone with the bone-gouge forceps; then introduced the elevator into the opening, and removed the depressed portions of bone, comprising a circle of about three-fourths of an inch in diameter. Half an hour after the operation it was found that sensibility had returned to the right arm, and that the right hand, which had previously been powerless, had recovered its strength. No untoward symptoms supervened, and the wound, which was kept open for two weeks to permit the free escape of pus, healed rapidly. On July 9th, while holding a candle and assisting in dressing a patient, he was suddenly seized with vertigo, and was immediately compelled to lie down. A full saline cathartic was given, and low diet ordered. No further cerebral symptoms occurred, and by the 20th he was perfectly convalescent. He was discharged August 5th, 1862. The case is reported by Assistant Surgeon J. S. Billings, U. S. A. In September, 1867, Pension Examiner John F. Ray reports that the vision in the left eye is impaired and intolerant of light. His disability is rated two-thirds and permanent.

CASE.—Lieutenant William Finn, Co. C, 14th Michigan Volunteers, aged 22 years, was wounded at the battle of Jonesboro', Georgia, September 1st, 1864, by a conoidal ball, which fractured the right parietal bone. He was on the same day admitted to the hospital of the 2d division, Fourteenth Corps, and on October 25th sent to the Officers' Hospital at Lookout Mountain, Tennessee. During the treatment several spiculæ of bone were removed. On November 5th, 1864, the wound had healed, and Finn received a leave of absence. He was mustered out on December 15th, 1864, on account of expiration of term of service, and was afterward pensioned on account of partial loss of sight in both eyes, with cephalalgia and dizziness. On March 26th, 1865, Pension Examiner J. N. Brown rated his disability one-half and permanent.

CASE.—Sergeant Robert Hays, Co. E, 13th Tennessee Cavalry, aged 32 years, received, in an engagement at Bull's Gap, November 12th, 1864, a fracture of the cranium. He was probably treated in a field hospital until May 17th, 1865, when he was admitted to the Asylum Hospital, Knoxville, Tennessee. He was discharged on May 24th, 1865, and was pensioned. On October 12th, 1867, Pension Examiner C. Wheeler reports that the wound was succeeded by necrosis and exfoliation, a large piece of the right parietal bone, measuring three inches in length by one inch in width, having been removed. The patient suffers from violent pain in the head, with vertigo, dimness of vision, and other distressing symptoms. His disability is rated total. In July, 1868, Hays was a pensioner at eight dollars per month, his disability being rated total.

CASE.—Private August Heiman, Co. K, 1st New York Cavalry, was wounded on picket, near Harrison's Landing, Virginia, August, 1862, by a piece of shell, which fractured the occipital and the upper edge of the right parietal bone. He was conveyed to Philadelphia, entering Broad and Cherry Streets Hospital on the 7th. On the 28th, he was transferred to the Satterlee Hospital. The wound was kept open to facilitate the discharge of pus, and the bowels were kept in a relaxed condition by the administration of sulphate of magnesia. As he had severe pain in the head, on November 25th, the wound was enlarged and a tent was introduced. An abscess in the scalp, just below the wound, was opened on the 27th, and a compress applied. A sequestrum of bone, one-half by one-fourth of an inch, was removed on the 8th of December, and on the 13th, several pieces were taken out. Again complaining of pain in the head, on the 26th, the wound was still further enlarged and another tent introduced. On January 23d, 1863, additional fragments of bone from both tables were removed. By the 31st, the scalp wound had almost entirely healed, but the patient complained of pain at the seat of injury and great dizziness upon making any exertion. On February 1st, he was slightly feverish, and still complained of pain in the head. On March 17th, he was transferred to the hospital guard for duty; but was re-admitted on the 19th, being unable to perform any duty. He was discharged from the service on March 30th, on account of general debility, irritability of the heart, and a constant headache. On July 25th, 1864, he applied for a pension and was examined by Dr. Charles Rowland, examining surgeon for pensions, Brooklyn, New York. The wound had healed, leaving a large indentation one inch in diameter, the scalp and membranes alone protecting the brain. The applicant's memory and vision in the right eye were impaired. The case is reported by Surgeon Isaac I. Hayes, U. S. V.

CASE.—Private Alexander Kreiger, Co. D, 7th Iowa Volunteers, aged 19 years, was wounded December 11th, 1864, while on picket near Anderson's Farm, Georgia, by a conoidal ball, which fractured the outer table of the left parietal bone near its superior posterior angle. He was immediately admitted to the regimental hospital, and thence sent to the corps hospital, where fragments of bone were removed. On the 19th, he was transferred to Beaufort, South Carolina, and January 23d, 1865, taken on the hospital steamer Ben Deford to the McDougall Hospital, New York, where he remained until March 14th, when he was transferred to the hospital at Keokuk, Iowa. On May 24th, 1865, he was transferred to Davenport, to be mustered out of service. He was discharged May 27th, 1865, and pensioned. Pension Examiner R. H. Wyman reported, on April 2d, 1867, that there was almost constant discharge from the wound, with defective eyesight and memory. He rated his disability two-thirds and permanent, unless removed by an operation.

CASE.—Private John Lanyon, Co. E, 140th New York Volunteers, aged 35 years, was wounded at the battle of Spottsylvania, Virginia, May 13th, 1864, by a conoidal musket ball, which entered the frontal bone to the right of the median line, near the coronal suture, and lodged beneath the scalp near the place of entrance, apparently without producing any fracture of

the skull. He was rendered unconscious from the shock, and lay in a state of insensibility until the missile was extracted by the regimental surgeon, Henry C. Dean, five hours after the reception of the injury. The ball was much flattened and weighed an ounce. The patient was at once conveyed to the division hospital, suffering at the time great pain in the head and constant dizziness. Forty-eight hours later, to avoid capture by the advancing enemy, he started on foot for Fredericksburg, some eighteen miles distant, which he reached in twenty hours, greatly exhausted. He was obliged to lay for ten hours after his arrival exposed to the rain before he could be admitted into a temporary hospital. He remained there four days and was then sent to Washington, and admitted into the Campbell Hospital on May 24th, 1864. About June 1st, he received a furlough and visited Buffalo, New York, where he came, on June 6th, under the care of Acting Assistant Surgeon S. W. Wetmore, who discovered that the frontal bone was fractured. The wound at this time was discharging freely; but there being no cessation of the headache and dizziness, Dr. Wetmore, on the 4th of July, removed the fractured portion of the external as well as some pieces from the internal table. On July 20th, Lanyon returned to Washington; was sent to the Lovell Hospital, Portsmouth Grove, Rhode Island, on July 30th, and thence sent, on August 24th, to the hospital at Rochester, New York, where he was discharged from service on the 26th of December, 1864. He was able to follow his trade as a carpenter, but as late as June, 1866, he had not become entirely free from attacks of dizziness and neuralgic pain. A communication from the Commissioner of Pensions, dated July, 1868, states that Lanyon is a pensioner at $6 per month, his disability being rated at three-fourths and permanent. On May 21st, 1869, Pension Examining Surgeon Horatio N. Loomis reported that this pensioner complained of headache and dizziness and dimness of vision and occasional faintness; but that he was able to work moderately a great part of the time.

Case.—Private John Lahey, Co. E, 38th New York Volunteers, was wounded at Fredericksburg, Virginia, December 13th, 1862, by a conoidal ball, which fractured the right temporal bone above the zygomatic arch, and lodged in the diploë. He was sent to Harewood Hospital, Washington, where the ball was removed at the first dressing. On December 25th, a triangular piece of the external table was removed through incision, and the inner table was found to be fissured. The wound healed rapidly by granulation, and on April 20th, 1863, the man was discharged the service. In June, 1864, Pension Examiner James Neil reports that there is incipient amaurosis, and that the mental powers seem to be somewhat obtuse.

Case.—Lieutenant Isaac N. Morgan, Co. B, 1st Maine Artillery, aged 23 years, was wounded at the battle of Spottsylvania, May 19th, 1864, by a conoidal ball, which entered above the inner angle of the right eye, fractured the supra-orbital ridge, and lodged in front of the right ear. The ball and a portion of the supra-orbital ridge were removed. The patient was admitted to the Seminary Hospital, Georgetown, on May 25th, 1864. He was transferred to the Officers' Hospital at Annapolis August 8th, 1864, and discharged August 15th, 1864. Lieutenant Morgan was afterward pensioned. On September 15th, 1865, Pension Examiner R. K. Jones reports that he has much pain in the forehead, and that any exposure to the heat of the sun, or exercise, causes giddiness, with severe pain in the other eye, and dimness of vision. He rates his disability total.

Case.—Private Daniel D. O'Donovan, Co. K, 59th Massachusetts Volunteers, aged 23 years, was wounded at the battle of the Wilderness, Virginia, May 6th, 1864, by a conoidal musket ball, which injured the orbital ridge of the frontal bone. He was, on May 11th, admitted to the Lincoln Hospital, Washington, D. C.; on May 16th, sent to the Patterson Park Hospital, Baltimore, Maryland; on June 17th, to the Knight Hospital, New Haven, Connecticut; on October 16th, to Readville; and thence, on October 24th, to the Dale Hospital, Worcester, Massachusetts, where he was discharged from service on March 2d, 1865, and pensioned. The vision of the left eye was totally destroyed, and the man suffered from morbid sensibility. On April 9th, 1867, Pension Examiner G. S. Jones reported this man to be suffering from a sympathetic affection of the right eye, with pain in the head and vertigo. He rates his disability total and probably permanent.

Case.—Private Joseph G. Robinson, Co. I, 14th Connecticut Volunteers, aged 54 years, was wounded at the Weldon Railroad, Virginia, August 19th, 1864, by a fragment of shell, which struck the right parietal bone at a point midway between the coronal and lambdoidal sutures, producing a compound comminuted fracture of both tables of the right parietal bone. He was admitted to the hospital of the Second Corps, and thence conveyed to Washington, D. C., and admitted into Carver Hospital on August 30th. The patient was somewhat emaciated, and there was slight constitutional disturbance. On September 11th, Acting Assistant Surgeon J. O. French made a crucial incision through the scalp, elevated the depressed edges of the fractured bone, and removed the detached sequestra of both tables. Anodyne poultices were applied, and afterward simple dressings. On the 15th, the patient was doing well, his constitutional condition having improved. On February 20th, 1865, he was discharged from the service by reason of impaired vision. He is a pensioner, and his disability is rated total and permanent.

Case.—Sergeant Thomas W. Scott, Co. A, 5th Ohio Volunteers, received, at Cedar Mountain, Virginia, August 9th, 1862, a gunshot fracture of the skull. He was, on August 6th, admitted to 2d division hospital at Alexandria, and discharged October 22d, 1862. Pension Examiner William Devens reports, October 26th, 1868, that a portion of the left parietal bone, one inch by three-fourths of an inch, comprising both tables, with the intervening diploë, have been removed, and that the patient, six years after the reception of the injury, was seriously affected by loss of eyesight, frequent headache, dizziness, and loss of memory.

Case.—Private Christian Strucoe, Co. K, 5th Michigan Volunteers, aged 32 years, was wounded at the battle of the Wilderness, Virginia, May 5th, 1864, by a conoidal ball, which fractured the frontal bone, imbedding itself in the outer angle of the left orbital ridge. He was, on May 12th, admitted to Douglas Hospital, Washington, and on May 26th, to Satterlee Hospital, Philadelphia. On August 9th, two small pieces of bone were removed from the wound. The case progressed favorably, and on August 25th, the patient was transferred to St. Mary's Hospital, Detroit, Michigan, and discharged from the service on June 17th, 1865, on account of gunshot wound causing loss of sight of the left eye. He had also received an injury to his back by a fall from a wagon. In March, 1868, he was a pensioner at $4 per month, his disability being rated total and permanent. The certificate is signed by Acting Assistant Surgeon H. C. Kibbie.

In two instances of gunshot fractures of the occipital bone, blindness ensued after the removal of fragments of bone, in consequence, no doubt, of some lesion of the optic centres, the nature of which could only be conjectured.

CASE.—Private John W. Snyder, Co. B, 49th Pennsylvania Volunteers, aged 22 years, was wounded in the trenches of Petersburg, Virginia, April 1st, 1865, by a conoidal ball, which fractured the skull at the apex of the lambdoid suture, involving, probably, both parietals and the occipital. He was sent to the hospital of the 1st division, Sixth Corps; thence to the Judiciary Square Hospital at Washington, where he arrived on the 12th. He lay in a stupor, from which he could, with difficulty, be aroused. His pupils were extensively dilated; the tongue was moist, and the pulse at 56; but no paralysis existed. The fractured portion of bone was depressed, and the brain matter was oozing out. On April 13th, Acting Assistant Surgeon F. H. Coulton removed a piece of depressed bone three-fourths of an inch square. The symptoms of compression of the brain now gradually subsided. During his convalescence, it was noticed that his vision was impaired, especially on the left side. By the 13th of June, the wound had cicatrized, except at one point, where, probably, some slight necrosis existed. About the middle of June, Assistant Surgeon Brinton Stone, U. S. V., by whom the foregoing facts were communicated, brought this patient to the Army Medical Museum, when a photograph of the cicatrix was made. (*Photographs of Surgical Cases and Specimens*, Vol. I, No. 44). On June 19th, the patient was transferred, convalescent, to the Douglas Hospital. He was discharged on September 29th, 1865, and pensioned. Pension Examiner G. G. Hartswick reports, October 11, 1869, this pensioner's disability as total, because of complete loss of vision.

CASE.—Captain Frank Gordon, Co. G, 121st New York Volunteers, aged 30 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 8th, 1864, by a conoidal musket ball, which fractured the occipital bone at the protuberance. He was admitted, on the same day, to the 1st division, Sixth Corps, hospital, and on the 16th, sent to the 1st division hospital at Alexandria. On examination, the fracture was found to extend one and seven-eighths inches, being one inch wide at the largest space. Fragments of bone were removed and ice applied. Extensive suppuration followed. On June 15th, several pieces of dead bone were removed, followed by hæmorrhage; the orifice was kept open by sponge tents. He had so far recovered in July that a leave of absence was granted to him. On his return from furlough, he was admitted to the Officers' Hospital, Annapolis, Maryland. On October 7th, 1864, he was discharged from service and pensioned. Examiner J. A. Brown, M. D., reported, February 18th, 1865, that there was partial paralysis of the optic nerve of both eyes, the right being most affected. Exertion caused pain in head and vertigo.

Deafness.—In the cases of this category, deafness was a less frequent complication than defective vision. It was generally associated with impairment of other special senses or of the mental faculties:

CASE.—Private Charles Burger, Co. G, 70th New York Volunteers, was wounded at the battle of Williamsburg, Virginia, May 5th, 1862, by a musket ball which entered the left side of the head, passed through zygoma and emerged at the mastoid process of the temporal bone. He was conveyed to Baltimore, Maryland, and admitted into McKim's Mansion Hospital on May 10th. Four fragments of bone were removed from the squamous portion of the left temporal bone; the largest measuring one-fourth by one inch. He improved rapidly, and on August 6th, 1862, was discharged from service, having recovered, with paralysis of the seventh pair of nerves. The pathological specimen, contributed by Surgeon L. Quick, U. S. V., is figured in the adjacent wood-cut, (FIG. 114). In August, 1869, Burger was a pensioner at $4 per month, his disability being rated one-half. The certificate of Pension Examiner D. A. Otis, dated April 25th, 1864, states that the sight of the left eye and the hearing of the left ear are destroyed, and that twenty-eight necrosed pieces of bone had been discharged from the wound.

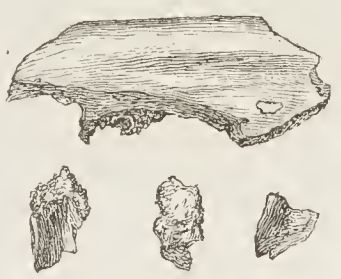

FIG. 114.—Fragments of temporal removed after gunshot fracture. *Spec.* 411, Sect. I, A. M. M.

CASE.—Private George Schroeder, Co. A, 82d Illinois Volunteers, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball, which fractured the mastoid portion of the right temporal bone. On May 5th, he was admitted to the hospital of the 3d division, Eleventh Corps, where fragments of bone were removed by Surgeon C. S. Wood, 66th New York Volunteers. On May 26th, the patient was sent to 2d division hospital at Alexandria, and on September 16th, 1863, returned to duty. He was discharged, August 26th, 1864, and pensioned. His pension was increased in September, 1867, reduced in September, 1869, and in March, 1870, he applied for an increase of pension, claiming that his disabilities had increased. Pension Examiner J. W. Thompson certifies that there was a depression in the mastoid portion of the temporal, and that the patient complained of neuralgic pains on the right side of the head, and of deafness of the right ear; but after several weeks of observation of this pensioner, he did not recommend any increase over his present rate for three-fourths disability.

CASE.—Private H. Elkin, Co. I, 35th Ohio Volunteers, aged 23 years, was wounded at the battle of Chickamauga, September 19th, 1863, by a conoidal ball, which entered at a point one-fourth of an inch posterior to the left ear, and immediately anterior to the lower portion of the mastoid process, opening the meatus, and emerged from the forehead at a point two inches above the outer canthus, and one inch above the superciliary ridge of the left eye. He was admitted to the hospital of the 1st division, Fourteenth Corps, and on September 29th, was sent to Hospital No. 1, at Chattanooga. There were no cerebral symptoms. Some small spiculæ of bone were removed from the upper opening. No unfavorable symptoms presented themselves. The patient was, on November 13th, sent to the field hospital at Bridgeport, Alabama; on November 14th, to Cumberland; December 6th, to Taylor Hospital, Louisville, Kentucky; and February 23d, 1864, to Jeffersonville, Indiana, whence he was

returned to duty February 29th, 1864. He was discharged August 31st, 1865, and pensioned. Pension Examiner J. S. McNeeley reported, in October, 1867, that there was total loss of hearing in the left ear, and of sight in the left eye, and mental imbecility, unfitting this pensioner for business pursuits or for manual labor.

CASE.—Private Richard S. McLaury, Co. G, 101st New York Volunteers,received, in the engagement near Chantilly, Virginia, September 1st, 1862, a fracture of the right parietal, and a slight wound of the scrotum. He was conveyed to Washington and admitted to Douglas Hospital. On October 25th, a piece of bone was removed from the skull; otherwise the wound did well, and the patient was sent to Jarvis Hospital, Baltimore, where he was discharged from the service on December 27th, 1862, and pensioned. In September, 1863, Examiners O. S. Bundy and J. G. Orton reported that this pensioner had defective hearing and vision, and that his intellect was impaired and general health seriously undermined. They rated his disability as total. No improvement is noted in the reports since that date.

CASE.—Private Oliver M. Phillips, Co. B, 58th Massachusetts Volunteers, aged 29 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball, which entered near the superior angle of the occipital bone and emerged about one inch above. He was admitted to the hospital of the 2d division, Ninth Corps, and on June 7th, sent to the 1st division hospital at Alexandria, where several pieces of bone were removed. Here he remained until February 25th, 1865, when he was sent to the Fairfax Seminary Hospital. He recovered, and was discharged from the service on May 29th, 1865. The Pension Examiner reported, September 21st, 1865, that there was a depressed cicatrix near the vertex, half an inch wide and three inches in length, and that the patient was totally deaf in the right ear, and that he had constant pain in the head.

The following two cases were believed to be examples of recovery with balls lodged in the brain. (See p. 193, *ante*.)

CASE.—Corporal Ellroy Churchill, Co. A, 1st New York Mounted Rifles, aged 23 years, on April 8th, 1863, was admitted to Ladies' Home Hospital, New York, with a gunshot wound of the head. The missile had entered just anteriorly to the right ear, and lodged in the external auditory canal. On admission, there was free purulent discharge from the right meatus. In front of the corresponding tragus was the scar of a gunshot wound. Deep in the external auditory canal was a mass of florid granulations giving issue to pus, and supposed to cover the seat of the rifle ball. Deafness was marked, but not complete, proving that the internal ear remained uninjured. The auditory canal was kept clear, and a solution of nitrate of silver was applied to the granulations with a view of reducing their size and making exploration for the ball possible. On May 9th, the patient was placed under the influence of chloroform, and two small pieces of carious bone were removed from a mass blocking up the canal. The meatus was freely incised, and a plug of sponge introduced with the expectation of making another attempt to remove the remaining mass and to reach the ball, but before the latter operation could be attempted, the patient was discharged from the service on May 20th, 1863, and left the hospital. Pension Examining Surgeon W. M. Chamberlain reported, August 4th, 1863, that there was a ball lodged in the right temporal bone, causing necrosis and loss of hearing. The patient appears not to have been pensioned at the time. The records of the Interior Department show that the case was reopened for investigation March 17th, 1870, the patient having insisted on his right to pension.

CASE.—Private Richard N. Thorndyke, 2d Battery, 1st Maine Artillery, aged 23 years, was wounded at the battle of Gettysburg, July 2d, 1863, by a conoidal ball, which struck the left side of the head one inch and a half above and behind the ear, penetrated the skull, and lodged. He was admitted to the Camp Letterman Hospital on the following day, and, on the 19th, transferred to the hospital at York, Pennsylvania. The patient stated that he was insensible for an hour or more after the reception of the wound, that a portion of the bone had been removed, and that he had suffered constant pain in the opposite side of the head. He was deaf in the left ear, and had confused hearing in the right. Cold-water dressings were applied, and by August 7th, the wound had healed; but dizziness still occurred whenever exposed to the solar heat. He was discharged from the service on November 30th, 1863, with loss of hearing, impaired mental power, and imperfect vision, the missile still undiscovered. In 1866, he was examined by Dr. Charles N. Germaine, pension examining surgeon. The missile still remained in his brain, causing total deafness of left ear, impaired eyesight, defective memory, vertigo, weakness, and inability to walk, and wholly unfitting him to perform any manual labor. He is a pensioner, and his disability is rated total and permanent.

The patient whose history is related in the next abstract must afford an interesting subject for physiological study—the senses of smell, vision, hearing, and taste being more or less completely destroyed on one side, in connection with facial paralysis:

CASE.—Private Albert W. Bullock, Co. B, 22d Wisconsin Volunteers, aged 22 years, was wounded at Atlanta, Georgia, August 17th, 1864, by a conoidal musket ball, which entered the left side of the head two inches in front of the ear, and emerged one and a half inches behind the ear, fracturing the mastoid process of the temporal bone. He was admitted to the hospital of the 3d division, Twentieth Corps, and, on September 1st, sent to Hospital No. 1, Chattanooga. On October 15th, he was admitted to the Joe Holt Hospital, Jeffersonville, Indiana; thence sent to the Jefferson Barracks, St. Louis, Missouri; on December 16th, transferred to the Swift Hospital, Prairie du Chien, Wisconsin; and on February 9th to the Harvey Hospital, Madison, Wisconsin. At the latter hospital it is stated that, on August 15th, 1864, several pieces of the mastoid process were removed. On May 23d, 1865, Bullock was mustered out of service. In 1868, he was a pensioner at four dollars per month, his disability being rated at one-half and temporary. His pension was afterward increased to fifteen dollars per month, Pension Examiner H. B. Johnson, M. D., having certified as follows: "The wound leaves him with complete loss of hearing, taste, and smell of left side, with partial blindness of that eye from retinitis; also has paralysis of all the muscles of the injured side,

inability to close the eyelids, and tenderness of eyeball. The condition of the brain induces vertigo and unsteadiness of gait. He cannot stoop for many moments without complete syncope. The deformity is very considerable, causing an appearance of imbecility when seen from the injured side. So far as known, his habits are good. The disability seems to be permanent in character, and, in my opinion, is total."

Erysipelas.—The comparative rarity of erysipelatous complicatons of injuries of the head, especially among the Union troops, has been adverted to several times in the preceding pages of this chapter.* The observation holds good in regard to the cases of gunshot fractures of the skull in which it was necessary to remove fragments. In the histories of one hundred and twenty-six patients of this series who recovered and were discharged and pensioned, this complication is noticed in three instances only.

CASE.—Private Jacob Arnold, Co. E, 64th New York Volunteers, aged 22 years, received, at the battle of Antietam, Maryland, September 17th, 1862, a gunshot fracture of the left parietal bone, with depression of both tables. Treated first at his regimental hospital, he was sent, on September 24th, to the general hospital at Frederick. On admission, he had complete paralysis of the right leg and arm, and several convulsions soon after occurred. A crucial incision was made, and depressed bone was elevated and removed by Assistant Surgeon R. F. Wier, U. S. A. The flaps were then replaced, and adhesive strips and cold-water dressings were applied. Erysipelas of the forehead supervened, but this was successfully treated by the usual remedies. By November 17th the wound had cicatrized, and by April, 1863, the paralysis had disappeared. Arnold was discharged from the service May 21, 1863. He is a pensioner, and his disability is rated total.

CASE.—Private William Bennett, Co. B, 7th Michigan Volunteers, was wounded at the battle of Gettysburg, July 2d, 1863, by a piece of shell, which fractured the frontal bone just above the eye. He was admitted to the hospital of the 2d division, Second Corps, and on July 7th was sent to Mower Hospital. On July 17th, erysipelas set in, but was readily checked. On July 20th, a piece of loose bone was removed. From that time the wound healed rapidly, and in December, 1863, the patient was doing light duty in the ward. On August 22d, he was sent to Detroit, and discharged from the service on September 2d, 1864. He is a pensioner, suffering frequently from headache and dizziness, and his disability is rated one-half and temporary.

CASE.—Private Erick Ward, Co. C, 31st Iowa Volunteers, aged 29 years, was wounded in an engagement before Vicksburg, Mississippi, May 20th, 1863, by a spherical musket ball, which fractured the left parietal bone. He was, on May 23d, admitted to hospital steamer Nashville; on June 6th, transferred to steamer R. C. Wood; and on June 8th sent to Union Hospital at Memphis. On July 9th, he was sent to City Hospital, St. Louis, where portions of the fractured bones were removed, leaving the brain exposed. On July 26th, he was sent to Jefferson Barracks, where he was treated for erysipelas and acute conjunctivitis. He was finally discharged on May 10th, 1864, and pensioned. At that date, Pension Examiner F. G. Porter sums up the case as follows: "The result is a loss of a portion of the left parietal bone and partial paralysis of the right side; epilepsy and deafness of the right ear, and impaired vision." On March 25th, 1870, this pensioner applied for an increase of pension, on the ground that his disabilities had augmented.

Gangrene.—Several of the cases of this subsection were complicated with sloughing. The fatal cases will be noted farther on. The four following recovered, and were pensioned:

CASE.—Corporal James P. Barton, Co. C, 36th Illinois Volunteers, aged 21 years, was wounded in a skirmish at Adairsville, Georgia, May 17th, 1864, by a conoidal ball, which struck the skull about three inches above the left ear, split upon the bone, and lodged. One-half of the missile was removed at the first dressing. He was admitted to the field hospital at Resaca, and, during the first three weeks, he was insensible. He remained in that hospital until the 22d of June, when he was transferred to the Cumberland Hospital, Nashville. At this time there was a moderate discharge from the wound. About the latter part of August, gangrene set in, and laid the skull bare for a large space around the wound, exposing the attachments of the external ear. At this stage the remaining portion of the ball, battered and misshapen, was discovered and removed. At the same time several pieces of bone were taken out, one nearly one inch square, from the squamous portion of the temporal bone, and another nearly as large from the parietal. The patient stated that some of the brain substance was removed at several of the dressings, but he did not know whether there was hernia cerebri or not. He went home on furlough on September 15th, and returned on December 1st. On January 26th, 1865, he was returned to duty, and served with his regiment until mustered out of service on October 8th, 1865. During this time he was troubled very much with headache and pains in the region of the wound. On May 8th, he was examined for a pension by Dr. John Young, examining surgeon for pensions at Monmouth, Illinois. The headache and pains in the region of the wound still continued, but were not so severe or frequent. There was a depression at the place of injury about two inches in length and three-fourths of an inch in width, of a crescentic form, apparently closed by firm fibrous tissue. There was also a groove running from the lower posterior corner of the depression downward and backward a distance of one and a half or two inches, and another, about an inch long, running directly downward toward the ear. With the exception of the occasional headache before mentioned, he felt no inconvenience from the injury.

CASE.—Private Edwin S. Edgerly, Co. E, 12th New Hampshire Volunteers, aged 20 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball, which fractured and depressed the cranium. He was admitted

* See pp. 77, 101, and 185, *ante*.

to the Third Corps field hospital on the next day; sent to Mount Pleasant, Washington, on May 8th; transferred to the McClellan Hospital, Philadelphia, June 19th; to the Knight Hospital, New Haven, Connecticut, August 9th; and thence to Brattleboro', Vermont, August 10th, 1863. Fragments of bone had been removed at different times. Gangrene of the wound appearing, bromine was applied to it, and subsequently simple dressings. On February 5th, 1864, the patient had sufficiently recovered to be discharged from the service. On August 7th, 1866, Pension Examiner Ira S. Chase reported that the patient is wholly unable to do any manual or mental labor. His disability is rated total and permanent.

Case.—Private Israel M. Ruff, Co. B, 142d Pennsylvania Volunteers, aged 21 years, was wounded at the battle of Gettysburg, Pennsylvania, July 1st, 1863, by a fragment of a shell, which comminuted both tables of the skull at the right parietal eminence, and rendered him insensible for a short time. He was conveyed to a field hospital, where the wound was enlarged, and spiculæ of both tables were removed, while the patient was under the influence of chloroform. On July 23d, he was admitted into the Broad and Cherry Streets Hospital, Philadelphia, Pennsylvania. No constitutional derangement existed at that time. A granulating surface one inch in diameter, over which the brain pulsations were distinctly visible, occupied a position corresponding to that of the parietal eminence. Plain nutritious diet was ordered, and the wound dressed with a weak solution of sulphate of copper. Under this treatment he continued to improve until August 5th, when he was taken with fever, and his wound began to slough. The sloughing continued for several days, until it occupied a space two inches in diameter, but of slight depth. A weak solution of chlorinated soda was applied, and healthy granulations again sprung up. By October 1st the wound had almost cicatrized, though the brain pulsations were still visible. He was discharged from the service on December 16th, 1863. Pension Examiner J. W. Blackburn reported, January 6th, 1864, that there was persistent pain in the forehead, and weakness of sight and of intellect. A communication from the Commissioner of Pensions, January 2d, 1868, states that Ruff is a pensioner, and that his disability is rated at three-fourths and permanent. Acting Assistant Surgeon John Neill reports the earlier facts of the case.

Case.—Private Asbell A. Webster, Co. I, 19th Michigan Volunteers, received, at the battle of Peach Tree Creek, Georgia, July 20th, 1864, a gunshot fracture of the parietal bone. He was insensible or delirious for a considerable time. He was taken to the hospital of the 3d division, Twentieth Corps, and on July 27th, admitted to Cumberland Hospital, Nashville. Six or eight pieces of bone, the largest three-fourths of an inch in length, were removed by Assistant Surgeon S. C. Ayers, U. S. V., from the cranium, exposing the dura mater. The wound became gangrenous, and a portion of the scalp, the size of a half dollar, sloughed away. On June 27th, the wound had healed, but sores would break out occasionally, especially in hot weather. On October 25th, he was sent to St. Mary's Hospital, and on December 10th, transferred to Harper Hospital, Detroit, Michigan, where he was discharged on January 6th, 1865. His mental faculties, especially his memory, were somewhat impaired, and the eyesight was, to some extent, weakened, according to the report of Pension Examiner R. F. Stratton. In 1868, he was a pensioner at $8 per month, his disability being rated total and temporary. The pathological specimen is No. 4731, Sect. I, A. M. M., and was contributed by the operator. It consists of seven small fragments of bone, most of them from the outer table, but the larger comprising both tables and the intervening diploë.

Foreign Bodies.—There were a few instances of recovery after removal of fragments of the skull for gunshot fracture. Such extraneous substances as cloth or felt or leather were extracted with the bone splinters, having been driven in from the soldier's hat or cap by the projectile. The missile itself, or portions of it, was of course often extracted with the bone fragments. The following series of six cases of this description can be collated with those referred to on pages 181 and 196. Other instances will be noted among the cases of removal of fragments of the skull that had a fatal issue:

Case.—Private C. C. Blake, Co. G, 2d United States Sharpshooters, aged 23 years, was struck, at the battle of Antietam, Maryland, September 17th, 1862, upon the top of his head, by ball and buckshot, the missiles passing laterally over the skull. Temporary symptoms of concussion followed, and after lying down fifteen or twenty minutes, the patient walked to a field hospital, a short distance to the rear. His lower extremities, especially the left, were numb. The same sensation existed in a slight degree in the arms. The wound of scalp was two inches long by one inch wide, and fracture of the skull not suspected. The head was shaved and cold water dressings were applied. At the expiration of forty-eight hours, the man started and walked to Frederick, a distance of twenty miles. At the hospital there, a portion of felt from his hat and some hair were removed from the wound. The patient was then sent to Washington, and thence, on the 24th, he was again transferred and arrived at DeCamp Hospital, David's Island, New York, on the 28th. A fissure of the right parietal bone, near the sagittal suture, was discovered. At the expiration of a week, an incision was made by Acting Assistant Surgeon E. B. Root, and some small portions of the external table were removed; the fissure was found to extend upward of two inches beyond the line of the incision. Five days subsequently portions of both tables were removed, exposing the dura mater to the extent of the size of a ten cent piece. The internal table, which was found depressed about four lines, was elevated. The patient had suffered from neuralgic pain over his eyebrows, extending through the right temple to the wound. These pains and the numbness of the extremities disappeared after the elevation of the depressed bone. The patient was discharged from the service on November 3d, 1862. The wound had nearly healed, there being a few granulations at its centre. These moved with the pulsations of the brain. No head symptoms existed. A communication from the Commissioner of Pensions, dated January 2d, 1868, states that Blake is a pensioner, and that his disability is rated total. The case is reported by Surgeon S. W. Gross, U. S. V.

CASE.—Sergeant Conrad Bryan, Co. H, 75th Ohio Volunteers, aged 25 years, was wounded at the battle of Chancellorsville, Virginia, May 2d, 1863, by a conoidal ball, which fractured the left parietal bone. He was admitted to the hospital of the 1st division, Eleventh Corps, and on June 15th, transferred to the Carver Hospital at Washington; but on the 20th, sent to the Mower Hospital, Philadelphia. The wound at this time was very much inflamed and discharging freely. Flax-seed poultices and subsequently cold water dressings were applied. On June 30th, a small portion of bone, together with a piece of his cap, which had been driven into the wound, were removed. On July 24th, he was transferred to the Seminary Hospital at Columbus, Ohio, the wound being nearly healed. Caries of the skull, however, ensued, followed by attacks of epilepsy. The patient was discharged from service on April 16th, 1864. He is a pensioner, his disability being rated total and doubtful. The early history of the case is reported by Surgeon George Suckley, U. S. V.

CASE.—Private William H. Whitelaw, Co. D, 2d Connecticut Heavy Artillery, aged 25 years, was wounded at the battle of Winchester, Virginia, September 19th, 1864, by a bullet from a spherical case shot, which perforated and depressed the frontal bone in the median line. He also received a flesh wound of the left thigh. He was at once admitted to the hospital of the 1st division, Sixth Corps, and thence conveyed, via Winchester and Martinsburg, to the hospital at Frederick, where he arrived on October 12th. The missile and fragments of bone had been removed before admission. No head symptoms existed. On November 20th, a circular disc of bone, the size of a bullet, came out of the orifice and was removed by the patient. The piece had apparently been cut out by the ball, and had been driven upon the brain. On the 28th, Acting Assistant Surgeon J. H. Bartholf removed two pieces of jagged bone, each an inch in length, and one-third of an inch in width, and of an irregular shape. Simple dressings were applied. The patient did well and was, on February 25th, 1865, transferred to the Knight Hospital, New Haven, and on May 15th, 1865, discharged from the service, by reason of surgeon's certificate of disability. On April 1st, 1868, Whitelaw was a pensioner; his disability being rated at three-fourths and temporary. Pension Examiner H. Pierpont reported the man incapable of active exertion; severe headache and roaring in the ears resulting from slight exercise.

CASE.—Private Joseph Aldridge, Co. A, 14th New York Volunteers, was wounded by a musket ball, which fractured the frontal bone, two inches above the left eye. The missile split upon the edge of the bone, and remained fastened to it, requiring much force to remove it. He was admitted to the Satterlee Hospital, Philadelphia, on July 26th, 1862. No treatment is recorded, but he recovered, and was discharged from the service August 25th, 1862. When examined for a pension by Pension Examining Surgeon H. B. Day, on December 4th, 1862, the wound had not yet healed. On May 16th, 1866, Examining Surgeon A. Churchill reported this pensioner's disability as total, in consequence of vertigo and loss of memory. Dr. Churchill states that he removed the ball at the time of injury. Dr. Day states that several fragments of bone had been removed, and that necrosed spiculæ came away for several months subsequently.

CASE.—Private Louis Fuhr, Co. B, McClellan's Dragoons, received, in an engagement near Cheese Cake Church, Virginia, May 4th, 1862, a fracture of the right parietal, from a musket ball, which struck near the upper posterior angle. On August 16th, 1862, he was admitted to De Camp Hospital, New York, whence he was discharged and pensioned January 5th, 1863. Examining Surgeon F. Rubach, reports that "the ball lodged, and was extracted, with several spiculæ of bone; that there was a deep depression of the skull at the seat of injury; that the patient was affected by vertigo and intense headache, and to a great extent hindered from performing his usual labor."

CASE.—Private Timothy Pender, Co. F, 3d Michigan Volunteers, was wounded at the battle of Chancellorsville, Virginia, May 2d, 1863, by a round musket ball, which struck the right side of the frontal bone, about one inch and a half anterior to coronal suture, fracturing both tables of the bone. The missile was removed on the field. He was admitted to regimental hospital; on May 25th, sent to Judiciary Square Hospital, Washington, and on August 3d admitted to St. Mary's Hospital, Detroit, Michigan. The wound was in a bad condition, and on examination the probe revealed necrosed bone. A crucial incision was made, and a ring of necrosed bone one-fourth of an inch in width and comprising both tables was removed, which had completely encircled the original wound. The operation exposed the dura mater for a space as large as half a dollar. The injury gave the patient but little trouble; he recovered rapidly; was discharged November 3d, 1863, and pensioned. On August 12th, 1867, Pension Examiner J. B. Scovel reports this man to be subject to vertigo and severe neuralgic pain in the head. He rates his disability three-fourths and permanent.

The forty following patients survived, with disabilities of various degrees. In nearly all, the brain was more or less seriously affected. Nine were insane. Many suffered from vertigo, headache, partial paralysis, inability to co-ordinate the action of the muscles, and other indications of injury of the nervous centres. This series completes the list of cases found on the records of recoveries after the removal of fragments in gunshot fractures of the skull, except cases of formal trephining and cases of cerebral hernia:

BRANNINGER, WILLIAM, Private, Co. I, 183d, Ohio, aged 43 years. Franklin, November 30th, 1864. Shell fracture of right side of occipital, Nashville, Jeffersonville, Washington, and Philadelphia hospitals. Fragments of bone removed April 22d, 1865. Wound healed May 19th. Discharged July 24th, 1865. August 15th, 1865, Examiner W. Owens, M. D., reports that the patient's mind was seriously impaired, and that large fragments of bone were removed after he left the hospital.

GERMAIN, HENRY J., Private, Co. K, 155th New York, aged 20 years. North Anna, May 18th, 1864. Shell fracture of left parietal. Alexandria, New York, and Buffalo hospitals. Discharged June 8th, 1865. Pension Office reports, November 8th, 1869, this pensioner partially insane, with defective sight and hearing, requiring a watcher.

Nourse, George H., Private, Co. F, 23d Massachusetts. Kinston, December 14th, 1862. Shell fracture of left parietal near the posterior superior angle. Foster Hospital, New Berne. Removal of fragments on the twenty-third day after reception of the injury, with immediate relief to the stupor, cephalalgia, and convergent strabismus, which had existed from the date of the wound. Transferred to Mason Hospital, Boston, February 14th, 1863. Discharged and pensioned April 27th, 1863. January 16th, 1867, Examiner J. W. Spalding, M. D., reports his disability as total on account of mental imbecility.

Wagner, Charles, Private, Co. L, 1st New York Cavalry, aged 25 years. Pistol ball fracture of temporal. Washington, June 26th, 1865. Armory Square Hospital. Removal of fragments by Surgeon D. W. Bliss, U. S. V., and ligation of posterior auricular. Transferred to Harewood Hospital August 15th; discharged October 12th, 1865. Pension Office reports, July 10th, 1868, disability total. Examiner P. S. Treadwell, December 13th, 1869, states that insanity is said to have ensued.

Libby, Samuel B., Private, Co. B, 17th Maine, aged 23 years. Spottsylvania, May 21st, 1864. Fracture over vertex by conoidal musket ball. Emory, Blackwell's Island, and Cony hospitals. Fragments removed; dura mater exposed; left leg partially paralyzed. Discharged December 15th, 1864. April 26th, 1865, Examiner D. O. Perry, M. D., reports complete left hemiplegia, mental obtuseness, and severe pain in the head, and rates the disability three-fourths and somewhat amenable to treatment. September 30th, 1867, Examiner T. A. Foster reports that this man, after recovering almost entirely from paralysis, had headache, temporary insanity, and epileptic fits.

Simming, Henry, Private, Co. F, 74th Pennsylvania. Cross Keys, June 8th, 1862. Gunshot fracture of upper angle of right parietal. Two inches of bone removed. Grafton Hospital, West Virginia. Discharged October 17th, 1864. January 3d, 1865, Examiner Cook, M. D., reported this applicant's mind deranged. In March, 1868, this man's disability was rated at three-fourths and temporary.

Lewis, Lucian, Private, Co. D, 69th New York, aged 18 years. Petersburg, September 30th, 1864. Fracture of occipital by conoidal musket ball. Corps, Judiciary Square, and Satterlee hospitals. Bone splinters removed and dura mater laid bare. Discharged May 16th, 1865. Pension Office reports him a pensioner, and that he suffers from cephalalgia and impaired mind.

Love, John, Private, Co. C, 57th Massachusetts, aged 35 years. Petersburg, October 8th, 1864. Depressed fracture of left parietal near vertex by conoidal ball. Corps, Beverly, and Satterlee hospitals. Removal of large fragments. Discharged May 24th, 1865. July 10th, 1868, disability rated total by Examiner Oramel Martin, M. D.

Byers, Thomas P., Corporal, Co. F, 18th Ohio. Murfreesboro', December 31st, 1862. Shell fracture near upper portion angle of left parietal. Fragments removed, leaving an opening an inch long and half an inch wide. Was hemiplegic for two months. Nashville, Hospital No. 14. Discharged April 29th, 1863. Examiner G. D. Hildreth rates the disability at three-fourths. Examiner J. H. Brown pronounces it permanent, and says that there is depression over the youthful corporal's posterior fontanelle.

Campion, Edward J., Corporal, Co. K, 20th Massachusettts, aged 31 years. Antietam, September 17th, 1862. Shell fracture of right temporal bone. Baltimore hospitals. Removal of spiculæ of bone. Discharged March 10th, 1863. Examiner David Choate, M. D., reports, November 27th, 1863, that the patient is subject to vertigo, palpitation, and morbid wakefulness.

Cleveland, William P., Private, Co. K, 51st New York, aged 23 years. Petersburg, July 7th, 1864. Shell fracture of frontal. Bone splinters removed. Ninth Corps hospital. Fairfax Seminary Hospital. Discharged from service January 21st, 1865, and pensioned. Examiner Samuel Hutchings reports, March, 1866, that the bone is gone over the right eye, which is weak, and rates the disability at three-fourths.

O'Connor, John, Private, Co. F, 86th New York, aged 27 years. Gettysburg, July 3d, 1863. Fracture of right parietal by conoidal ball. Missile lodged, but was removed on the field. Gettysburg and Philadelphia hospitals. Removal of small fragment of bone July 9th. Symptoms of a typhoid character supervened, but were readily subdued. Discharged September 19th, 1864. Examiner S. N. Pierce, M. D., June 12th, 1867, reports that the pensioner has convulsions, followed by severe prostration. Disability total and permanent.

Dugan, Patrick, Private, Co. A, 31st Massachusetts. Port Hudson, Louisiana, May, 1863. Gunshot fracture of cranium by a conoidal ball. Treated at barracks hospital, New Orleans. Discharged November 13th, 1863. August 17th, 1864, Examiner George C. Lawrence reports that a portion of the skull has been removed, and that the patient suffers from pain in head and dizziness. Disability three-fourths and permanent.

Dygert, Edwin F., Private, Co. D, 114th Illinois. Jackson, Tennessee, January 14th, 1863. Fracture of frontal by a pistol ball, near the median line. Accidental. Jefferson and St. Louis hospitals. Fragments of skull removed. Discharged June 5th, 1863. Discharge paper states that he has "lost control over his locomotion, so far as direction is concerned. He cannot walk in a straight line, but moves in a zig-zag." Examiner G. W. Cook subsequently reported that there was persistent pain at the point struck, with vertigo, and described the cicatrix as over the upper anterior angle of the right parietal.

Cutler, Hiram, Private, Co. B, 2d New Hampshire. Bull Run, August 29th, 1862. Fracture of right temporal and parietal by conoidal ball. Douglas Hospital. Removal of a fragment of squamous portion of temporal one by one and a half inches. Discharged December 14th, 1862. Pensioned. Complains of giddiness.

Nichols, Hiram B., Private, Co. C, 11th Maine, aged 18 years. Deep Run, August 16th, 1864. Fracture of right parietal at eminence. New York and Manchester hospitals. Discharged June 17th, 1865. September 14th, 1867, Examiner Charles W. Snow reports that several pieces of bone have been removed, leaving the brain exposed. The patient's memory is impaired, and he suffers from vertigo and headache. Disability three-fourths.

ALLEN, WILLIAM H., Corporal, Co. K, 111th Illinois, aged 23 years. Fort McAllister, Savannah, December 13th, 1864. Fracture of left parietal by conoidal ball. Corps, Beaufort, and New York hospitals. Removal of several fragments. Discharged May 6th, 1865. July, 1868, Pension Office reports his disability total and permanent.

GIPPLE, EMANUEL, Co. 1, 93d Pennsylvania, aged 24 years. Spottsylvania, May 12th, 1864. Shell fracture of temporal bone. Corps, Washington, Philadelphia, and Harrisburg hospitals. Discharged June 13th, 1865. June 1st, 1867, Examiner John Levergood, M. D., states that a piece of the outer table of bone has been removed. Disability one-half and permanent.

RICE, HIRAM E., Sergeant, Co. E, 112th New York, aged 22 years. Fort Fisher, January 15th, 1865. Shell fracture of frontal bone. Mansfield, New Berne, and Buffalo hospitals. Removal of fragments of bone. Discharged July 13th, 1865. Examiner G. W. Hazelton, March 29th, 1866, reports disability one-half and permanent.

MATHANY, WILLIAM F., Private, Co. C, 19th Ohio, aged 30 years. Chickamauga, September 19th, 1863. Gunshot fracture of frontal bone. Field and Cleveland hospitals. Removal of several fragments of bone. Discharged July 27th, 1864. Examiner C. D. Griswold, M. D., reports, July 27th, 1864, that the pensioner is mentally and physically disabled.

MERENER, GEORGE, Private, Co. K, 15th West Virginia, aged 18 years. Petersburg, April 2, 1865. Shell fracture of left parietal bone. Portsmouth and Baltimore Hospitals. Removal of fragment of bone one and a half by one inch. Discharged June 14th, 1865. Examiner W. S. Bates, M. D., reports, September 14th, 1866, that the pensioner suffers from attacks of blindness and giddiness, and that he is unable to work for many days together.

HOLLIS, JOHN E., Private, Battery I, 1st Massachusetts Heavy Artillery, aged 20 years. Spottsylvania, May 19th, 1864. Stellate fracture of occipital bone, right side, by conoidal musket ball. Corps, Washington, Readville, and Worcester hospitals. Removal of a fragment of bone through incision. Discharged November 20th, 1864. January, 1868, Pension Office reports his disability two-thirds and doubtful. Caries still existed.

JOCHUM, JOHN J., Private, Co. B, 14th New York State Militia, aged 26 years. Gettysburg, July 1st, 1863. Gunshot fracture of occipital and right parietal bones. Corps and New York hospitals. Removal of fragments from parietal and occipital bones. Discharged July 25th, 1864. Examiner Charles Rowland, M. D., states that the pensioner is unable to work, but that he will eventually recover. Disability three-fourths.

CHAPMAN, JOSEPH, Private, Co. K, 29th Wisconsin, aged 17 years. Compound fracture of right parietal bone by shell. Mobile, St. Louis, and Madison hospitals. About four square inches of bone were removed. Discharged October 5th, 1865. May 8th, 1869, Examiner William T. Galloway reports that the pensioner has the appearance of an epileptic. Disability total.

RHOADES, BENJAMIN F., Private, Co. I, 93d Pennsylvania, aged 24 years. Wilderness, May 5th, 1864. Gunshot fracture of both parietal bones, near lambdoidal suture. Washington and Philadelphia hospitals. Removal of bone by Acting Assistant Surgeon Nordman. Discharged February 18th, 1865. March 4th, 1868, Examiner John Levergood reports that the pensioner is disqualified for manual labor.

FLAVIN, EDWARD H., First Lieutenant, Co. A, 14th New York State Militia. Spottsylvania, May 8th, 1864. Gunshot fracture of anterior edge of occipital at crown of head. Corps, Washington, and New York hospitals. Removal of fragments of bone. Discharged June 6th, 1864. Examiner Charles Rowland, M. D., states, May 10th, 1865, that there is constant vertigo and partial loss of memory.

WOOK, JOHN M., Private, Co. C, 107th Pennsylvania, aged 23 years. Fredericksburg, December 13th, 1862. Shell fracture of frontal, a little to the right of the median line. Washington and Philadelphia hospitals. January 25th, 1863, removal of fragments of bone, leaving brain pulsations visible. Discharged March 24th, 1863. January 2d, 1868, Pension Office reports his disability one-half and temporary.

NICHOLS, WALTER, Private, Co. K, 7th Michigan, aged 24 years. Petersburg, June 22d, 1864. Gunshot fracture of frontal bone. Corps and Philadelphia hospitals. Fragments of bone removed at various times. Discharged January 5th, 1865. July 7th, 1868, Examiner S. S. Cutter, M. D., reports that the pensioner suffers from dizziness, dimness of vision, and general prostration, and that his nervous system is very much affected. Disability total and permanent.

MURPHY, OWEN, Private, Co. A., 6th New York Cavalry. Chancellorsville, May 3d, 1863. Gunshot fracture of parietal bone, near coronal suture. Washington and Baltimore hospitals. Removal of pieces of bone March 7th, 1864. Discharged July 9th, 1864. Examiner J. T. Burdick, M. D., reports, May 18th, 1867, that there is constant vertigo. Disability one-fourth and temporary.

MCBRIDE, SAMUEL B., Private, Co. G, 140th Pennsylvania. Chancellorsville, May 3d, 1863. Gunshot fracture of frontal by conoidal ball. Point Lookout and Philadelphia hospitals. Sharp points of bone, and several fragments removed. Discharged December 18th, 1863. February 24th, 1864, Examiner J. R. Wilson reports that the pensioner has pain and heaviness in head and along the cervical and dorsal regions of the spine.

POLLOCK, ALFRED, Private, Co. G, 78th Illinois, aged 21 years. Jonesboro', September 1st, 1864. Shell fracture of occipital near protuberance. Nashville and Quincy hospitals. Fragments of bone removed. Furloughed, and while at home had his left leg fractured by a threshing machine. Leg amputated. Discharged May 18th, 1865. Examiners Robbins and Bassett rate his disability from wound of head total and permanent, on account of vertigo and dizziness.

HANNAH, JOSEPH, Private, Co. B, 11th Missouri. Corinth, October 3d, 1862. Gunshot fracture of frontal bone. St. John's Hospital, Paducah, Kentucky. Removal of several spicule of bone. Discharged February 3, 1863. Examiner Thomas S. Hening, M. D., reports that the pensioner has pains in the head, and that his nervous system is in a morbid and excitable condition.

Russell, Clement H., Private, Co. F, 37th Massachusetts, aged 19 years. Wilderness, May 5th, 1864. Gunshot fracture of cranium by conoidal ball. Washington and Philadelphia hospitals. Removal of fragments of bone, leaving a large cavity in the skull. Discharged June 12th, 1865. December 6th, 1867, Examiner C. L. Fisk reported that the pensioner suffers from headache and dizziness, and is unable to bear exposure to heat or light. There is loss of memory, with cerebral excitement on taxing the brain to any great degree.

Pfaff, John W., Lieutenant, Co. A, 101st Indiana. Chickamauga, September 20th, 1863. Gunshot fracture of left parietal at the posterior superior angle. Corps, Chattanooga, and Nashville hospitals. Fragments of bone removed October 22d and 26th. Resigned February 21, 1864. Examiner T. S. Butler, M. D., November 23d, 1865, reports that the physical system of the pensioner is prostrated. Disability one-half and permanent.

Morgan, Patrick, Private, Co. B, 57th New York. Fredericksburg, December 11th, 1862. Gunshot fracture of left parietal bone by conoidal ball. Corps and Washington hospitals. Removal of a fragment of bone one and a half by two and a half inches. Space partially filled with callus. Discharged April 25, 1863. Examiner Alonzo Churchill, M. D., August 11th, 1868, reports that the pensioner suffers from dizziness and numbness of right foot and hand.

Terry, Arthur, Private, Co. B, 8th Connecticut, aged 18 years. Antietam, September 17, 1862. Fracture of the left side of the frontal by a conoidal musket ball, and flesh wounds of the side and shoulder. Made prisoner, and paroled September 30th, and sent to Camden Street Hospital, Baltimore. Necrosed fragments of the skull removed from time to time by Acting Assistant Surgeon A. W. Colburn. Discharged December 19th, 1862. In May, 1864, Examiner R. Strickland reports the wound firmly healed, and rates the disability at one-third and temporary.

McKatheran, Martin, Private, Co. I, 32d Massachusetts. Fredericksburg, December 13, 1862. Gunshot fracture of skull at vertex. Corps and Washington hospitals. Removal of fragments of bone. Discharged February 21st, 1863. Examiner George Stevens, M. D., reports, October 15th, 1866, that the pensioner has constant vertigo, and periodical pain.

Bullock, Alfred W., Sergeant, Co. C, 3d Massachusetts Cavalry. Sabine Cross Roads, April 8th, 1864. Gunshot fracture of frontal bone, left side, by conoidal ball. New Orleans and Readville hospitals. Removal of exfoliated bone. Discharged December 19th, 1864. May 9th, 1866, Examiner W. H. Page, M. D., states that the man suffers from dizziness and pain, especially on stooping.

Van Valkenburg, Calvin, Private, Co. I, 91st New York, aged 22 years. South Side Railroad, April 1st, 1865. Fracture of frontal by musket ball near junction of coronal and sagittal sutures. Fifth Corps, Lincoln, and Ira Harris hospitals. April 11, fragments removed by Surgeon J. C. McKee, with immediate relief of the symptoms of compression.[1] In 1865, Examiner W. H. Craig reported that this pensioner suffered from giddiness and pain in the head; and in July, 1868, the Pension Office reports that he is still a pensioner, his disability rated at three-fourths and permanent.

Leap, John C., Private, Co. G, 28th New Jersey, aged 43 years. Fredericksburg, December 13th, 1862. Gunshot fracture of frontal bone by round ball. Washington and Philadelphia hospitals. Spiculæ of bone removed by crucial incision. Difficulty of micturition, and pain in temples and nape of neck. Discharged March 6th, 1863. September 30th, 1869, Examiner James E. Armstrong, M. D., reports that the missile still remains within the cavity, and is supposed to be near the base of the brain.[2] His memory and sight are impared, and he is subject to attacks of vertigo and syncope.

The following series of abstracts refers to patients who recovered after gunshot fractures of the skull treated by the removal of fragments; but whose names, at last accounts, had not been placed upon the Pension Roll:

Case.—Corporal Maurice Fitzgerald, Co. E, 28th Massachusetts Volunteers, aged 25 years, was wounded at Fort Steadman, Virginia, March 25th, 1865, by a conoidal ball, which comminuted and depressed the left parietal bone one and a half inches to the left of the median line. On the following day, he was taken to the hospital of the 1st division, Second Corps, thence was conveyed to Washington, and admitted to the Emory Hospital on the 30th, being in a state of insensibility and unable to articulate or raise the right hand; his tongue inclined to the right side, when protruded. His pulse was slow but strong. Being placed under the influence of chloroform on March 31st, Surgeon N. R. Moseley, U. S. V., enlarged the wound, removing numerous portions of the cranium, with pieces of the ball. On April 2d, pills of calomel and extract of henbane were administered to produce slight ptyalism. On April 15th, the patient was able to walk and speak, and had proper use of all parts of the body. On June 3d, he was transferred to the Mower Hospital at Philadelphia; thence, on July 24th, was transferred to Massachusetts. The pathological specimen was contributed, with the history, by Surgeon N. R. Moseley, U. S. V., and is figured in the adjacent wood-cut. This soldier was discharged the service, July 22d, 1865. His claim for a pension is pending.

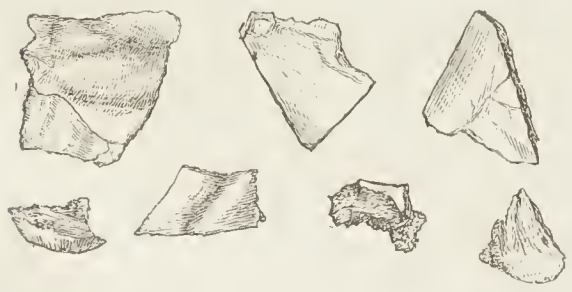

Fig. 115.—Seven small fragments of the left parietal bone. *Spec.* 4073, Sect. I, A. M. M.

Case.—Sergeant Brayton C. Bailey, Co. H, 84th New York Volunteers, aged 24 years, was wounded at the second battle of Bull Run, August 30th, 1862, by a conoidal ball, which fractured both tables of the cranium at the right frontal eminence.

[1] See photograph 9, Vol. III, of *Contributed Surgical Photographs*, A. M. M.

[2] See the series of nineteen cases on p. 193, *et seq.*, with which this would have been grouped had the evidence been more satisfactory.

Apparently the ball had split on the edge of the bone, and one part of the missile had passed into the cranial cavity. The patient was insensible for several days. On September 3d, he was admitted to the Sixth and Master Streets Hospital, Philadelphia, where he remained under treatment for four and a half months. Thence he was transferred to the Mower Hospital. Two months subsequently, his wound was probed and pieces of dead bone from both tables were removed. The wound discharged freely, but gradually closed; and the patient was discharged from the service on April 27th, 1863. Dr. G. S. Walker, of Ilion, Herkimer County, New York, writing under date of March 6th, 1866, says that the scar is about an inch and a half in diameter, and gradually depressed from its outer margin toward the centre. There seems to be a deficiency of bony tissue for about half an inch about the centre. The depression at the centre of the scar is about five-eighths of an inch. The skin over the scar has not yet assumed its natural color but is of a bluish tint. The patient's health had been good; but any severe exercise, mental or physical, would induce dizziness and a severe headache. At times, when perfectly quiet, he is attacked with a sharp pain, as if, according to his description, his "brain was being pierced with a pointed instrument at a point opposite the wound;" and at such times, any little jar of the head makes the pain so severe that it almost blinds him. Aside from these attacks, his health is good. He is not on the Pension Roll.

Case.—Private William L. Copeland, Co. A, 1st Mississippi Marine Brigade, aged 21 years, was wounded, July 4th, 1864, at Coleman's Cross Roads, near Rodney, Mississippi, by a musket ball, which entered the cranium two inches directly above the outer canthus of the right eye, fractured the frontal bone and lodged in the wound. The missile and fragment of bone were removed on the following day. He was conveyed to Vicksburg, and entered McPherson Hospital on the 6th. Anodynes were administered internally, and cold and emollient applications made to the wound. On the 1st of September, another piece of bone was removed, and on the 6th, a third fragment was removed by Surgeon E. Powell, 72d Illinois Volunteers. The wound continued very painful until after the removal of the last piece of detached bone, when it healed rapidly. He recovered sufficiently to act as nurse, but had lost his voice. When returned to duty on December 4th, 1864, he had recovered his voice. He is not a pensioner.

Case.—Private Louis Miller, Co. D, 46th New York Volunteers, aged 34 years, was wounded at Petersburg, Virginia, June 30th, 1864, by a shell, which fractured the cranium near the superior parietal angle. He was at once admitted to the hospital of the 3d division, Ninth Corps, where fragments of the parietal, temporal, and frontal bones were removed, and the flaps united by a slight suture. On July 3d, he was sent to Washington, and entered Harewood Hospital on the 4th, being somewhat uneasy but not complaining of pain. The pulse was slightly accelerated, tongue clean, and appetite good. Upon removing the suture the wound was found to be full of maggots. The dura mater was exposed for a space about three inches in circumference, and of a greenish color; the pulsations of the brain were distinctly visible. On the 6th, the flaps became gangrenous and were entirely destroyed. The wound was healthy, but the external layer of the dura mater was sloughing. Flax-seed poultices were applied. The upper margin of the wound granulated finely. An incision was made, and a dressing of chlorinated soda was employed. The granulation of upper margin continued healthy. On July 28th, secondary hæmorrhage occurred from the left temporal artery, which was ligated; about ten ounces of blood having been lost. From that time the wound assumed a healthy appearance. Small pieces of bone were removed as they became detached. Partial necrosis of the parietal bone supervened. The necrosed portion, consisting of both lamellæ, was removed. The discharge now became less copious, and the wound healed rapidly. Miller was furloughed on November 3d, 1864, returned on the 16th, and was discharged from the service on July 25th, 1865, being, at the time, in very good health. He is not a pensioner. The case is reported by Surgeon R. B. Bontecou, U. S. V.

Case.—Private William Furlong, Co. G, 153d Pennsylvania Volunteers, aged 33 years, was wounded at the battle of Gettysburg, Pennsylvania, July 1st, 1863, by a fragment of shell, which struck the external angular process of the frontal bone and carried away the left superciliary ridge. The wound was about one and a half inches in width and four inches in length. He was insensible only for a short time, and, considering the serious nature of the injury, it is remarkable that he walked with his companions to a sand-bank, and actually dug therefrom, with his own hand, the fragments of the shell which inflicted the injury. He received little or no treatment until July 16th, when he was admitted to Cotton Factory Hospital, Harrisburg, Pennsylvania. Tepid water was injected into the wound, and several spiculæ of bone were removed from the substance of the brain. One piece, however, was not removed and still remains, as it was feared that hæmorrhage would follow; besides, the conscious condition of the patient did not warrant further interference. The pulse throughout remained normal, and sleep natural. On August 10th, the patient was cheerful, and healthy granulations had commenced. There was considerable tumefaction of the left eye, and inability to move the lids. On forcibly opening them the pupil was found dilated; the intellect was unimpaired. On August 18th, the pulsations of the brain were still manifest, although granulations were nicely closing the wound. During August and September, scales and spiculæ of bone which were forced to the surface by the granulations, were removed. He was discharged on September 14th, 1863. He is not a pensioner. The case is reported by Acting Assistant Surgeon Lewis Post.

Case.—Private Thomas B. White, Co. K, 94th Ohio Volunteers, was wounded at Murfreesboro', Tennessee, December 31st, 1862, by a conoidal ball, which struck the posterior angle of the left parietal bone at a point equidistant one inch from the sagittal and lambdoid sutures, passed through the posterior portion of the left hemisphere of the cerebrum, and lodged upon the tentorium cerebelli, a distance of three inches from point of entrance. He became completely insensible, but recovered within an hour, and, with the aid of an assistant upon either side, walked to the field hospital. Careful examination showed that the ball was not impacted in any of the structures; it was therefore removed, together with a few loose spiculæ of bone. During the operation some brain substance escaped. Shortly afterward he became insensible, and remained so for three weeks. When consciousness returned, he was unable to move his right arm or leg, was very deaf, especially in the right ear, complained of loss of vision of right eye, and could with difficulty speak. He improved very slowly, and at the end of April, 1863, could stand alone. He was discharged April 28th, 1863. In August, 1863, he looked well, and could walk without difficulty; the

motion of his arm was yet imperfect, but the wound was almost healed. Small spiculæ of bone, too firmly attached to be removed at the date of the first operation, had from time to time been loosened and detached by the efforts of nature. No pension granted. Case still pending.

Case.—Private Patrick Finnegan, Co. I, 61st New York Volunteers, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a round ball, which struck the skull obliquely, fracturing both tables of the right parietal bone, just above the superior edge of the temporal bone. The ball split; one half escaped, the other half, flattened, lodged between the tables. He was taken prisoner, and remained in the hands of the enemy until May 15th, when he was admitted to the hospital of the 1st division, Second Corps. The left arm and leg were paralyzed, and a number of pieces of bone were fixed in the substance of the brain. Two or three ounces of pus, mixed with portions of brain, escaped. The bone around the orifice was denuded on outer and inner surfaces. On about May 21st, spiculæ of bone and portion of ball were removed by Surgeon C. S. Wood, 66th New York Volunteers, when the paralysis abated. On June 14th, he was admitted to the hospital at Point Lookout, Maryland. A number of small spiculæ of bone escaped from time to time, but the healing process continued without interruption. The patient's mind appeared somewhat debilitated, and his hearing was imperfect, but he was in excellent spirits, sleeping and eating well. He was discharged on June 10th, 1865.

Case.—Private Henry R. Cox, Co. D, 47th New York Volunteers, aged 23 years, was wounded at the battle of Olustee, Florida, February 20th, 1864, by a conoidal musket ball, which fractured the right side of the frontal bone, without apparently causing a depression. He was admitted to the hospital at Jacksonville, Florida, February 22d, 1864, and sent on the 25th to Hilton Head, South Carolina, where several fragments of depressed bone were removed, and simple dressings applied to the wound. In May, 1864, he was transferred to New York, and on the 12th admitted to the St. Joseph Hospital, Central Park. He recovered, and was mustered out on June 10th, 1865. He is not a pensioner.

Case.—Private Peter Englehart, Co. E, 10th Wisconsin Volunteers, aged 25 years, was wounded near Kenesaw Mountain, Georgia, June 18th, 1864, by a piece of shell, which struck the *os frontis* at the junction of the frontal and left parietal bones, causing a slight depression. He received in the same engagement a perforating flesh wound of the left leg four inches below the knee. He was at once admitted to the 1st division, Fourteenth Corps, field hospital; on June 29th, sent to No. 1, Chattanooga; and thence, on July 12th, transferred to Hospital No. 8, Nashville. On July 19th, he was again transferred to the Jefferson Hospital, Jeffersonville, Indiana, and thence, per steamer R. C. Wood, sent to the Simons Hospital, Mound City, Illinois. The records of the latter hospital state that the patient remained insensible for ten days subsequent to the injury, and that two small pieces of bone were removed. The wound healed. On September 24th, Englehart was admitted to the hospital at Keokuk, Iowa, and discharged from the service on October 13th, 1864. He is not a pensioner.

Case.—Private Charles W. Webb, Co. B, 144th New York Volunteers, aged 18 years, was wounded at Pocotaligo, South Carolina, December 6th, 1864, by a musket ball, which fractured and depressed the left parietal bone. He was on the same day admitted to the regimental hospital, and transferred, on December 9th, to the hospital at Beaufort, South Carolina. He had lost the power of speech, and was hemiplegic on the right side. A small portion of the brain substance, which protruded, had sloughed away, exhibiting clearly the depressed portion of bone. On December 15th, Surgeon John Trenor, U. S. V., removed several fragments of the outer table and elevated the inner table. Water dressings were applied. The wound was kept thoroughly cleansed by syringing with water and solution of chlorinated soda, and the bowels were kept laxative by cathartics. He improved gradually, regained his speech, and recovered by degrees the use of the right arm and leg. He was transferred on January 23d, 1865, and entered McDougall Hospital, Fort Schuyler, New York Harbor, on January 29th. On April 28th, he was transferred to Troy, New York, where he remained until June 12th, 1865, when he was discharged from the service. He is not a pensioner. The case is reported by the operator.

Case.—Private August Wiesner, Co. A, 50th Pennsylvania Volunteers, aged 25 years, was wounded at Petersburg, Virginia, June 28th, 1864, by a conoidal ball, which fractured and depressed the left parietal bone between the parietal eminence and the lambdoidal suture. He was conveyed to the field hospital of the 3d division, Ninth Corps, where the depressed portion was elevated by Surgeon Wells B. Fox, 8th Michigan Volunteers. The patient was sent to City Point, and thence, by hospital steamer, to the McDougall Hospital, Fort Schuyler, New York Harbor, which he entered on July 10th. He remained until August 18th, when he was furloughed, and ordered to report at the expiration of his leave to the medical director at Philadelphia. He entered Mower Hospital on September 20th, and was discharged from the service on July 14th, 1865. He is not a pensioner.

Case.—Sergeant John Walton Hartley, Co. I, 61st New York Volunteers, was, on June 12th, 1862, admitted to Twenty-second and Wood Streets Hospital, Philadelphia, with a gunshot wound of the head. The missile had removed the external table of the right parietal bone and depressed the inner table. He was furloughed, and while at his home, the depressed portion of the inner table was removed. He was discharged on January 28th, 1863. His left side was partially paralyzed. Not a pensioner.

Case.—Private John Duffy, Co. A, 28th Massachusetts Volunteers, received, at the battle of Bull Run, Virginia, August 31st, 1862, a gunshot fracture of the external table of the left parietal bone. He was admitted into the Carver Hospital, Washington, September 7th; on December 10th, he was furloughed; and was discharged the service February 6th, 1863. On May 21st, 1863, Pension Examiner G. S. Jones reports this man to have a depression in the skull from which loose bone has been removed, and to be suffering from cephalalgia and vertigo. He rates his disability one-half and doubtful. On April 13th, 1865, Pension Examiner J. T. Galloupe reports this man to have re-enlisted February 28th, 1864, as a private in the 29th Massachusetts Volunteers; and to have done full duty from that time until the date of his report, when the man was a paroled prisoner of war, his disability being removed.

CASE.—Corporal Patrick Farrell, Co. C, 140th New York Volunteers, aged 26 years, was wounded at the battle of Spottsylvania, Virginia, May 9th, 1864, by a conoidal musket ball, which fractured the skull. He was at once admitted to the 1st division, Fifth Corps, hospital, and thence, on the 12th, sent to the 3d division hospital at Alexandria. A few small scales of bone were taken from the wound by forceps, but no untoward symptoms manifested themselves in the progress of the case. On June 6th, the patient was furloughed. He was discharged the service September 6th, 1864, On February 25th, 1864, Pension Examiner H. T. Montgomery reports this man to be perfectly healthy looking, and complaining only of nervousness. He does not think him disabled by the wound.

MCQUEENY, JOHN, Private, Co. I, 2d Connecticut Heavy Artillery, aged 18 years. Cedar Creek, October 19th, 1864. Gunshot fracture of zygomatic process of left temporal bone. Corps, Philadelphia, and New Haven hospitals. Portions of zygoma were removed. Discharged June 20th, 1864. Not a pensioner.

MOSBERY, ALEXANDER, Private, Co. E, 40th New York, aged 22 years. Petersburg, March 25th, 1865. Gunshot fracture of cranium one inch below squamous suture, right side. Corps, Washington, and Whitehall hospitals. Removal of depressed bone by incision. Discharged July 3d, 1865. Not a pensioner.

BARR, THOMAS T., Co. H, 33d Ohio Volunteers, aged 24 years. Chickamauga, September 20th, 1863. Fracture of skull below and to the left of the occipital protuberance by shell. Treated in Confederate hospitals at Ringgold and Richmond. Paroled March 6th, 1864, and admitted to hospital at Annapolis Junction. Ten fragments of bone removed. Discharged September 20th, 1864. Not a pensioner.

MCCORMICK, WILLIAM C., Private, Co. A, 80th Illinois, aged 30 years. Atlanta, August 20th, 1864. Gunshot fracture of frontal bone. Atlanta, Chattanooga, and Nashville hospitals. Removal of fragments of bone. Mustered out June 10th, 1865. Not a pensioner.

NUTZE, CHARLES F., Sergeant, Co. B, 6th Pennsylvania Cavalry, aged 32 years. Culpeper Court-house, August 1st, 1863. Gunshot fracture of external angular process of temporal. Corps and Washington hospitals. Fractured bone removed. Discharged March 3d, 1864. Sight of left eye lost. Not a pensioner.

MURGATROYD, GEORGE M., Captain, Co. A, 68th Pennsylvania, aged 32 years. Jacob's Ford, November 27th, 1863. Gunshot fracture of zygoma. Alexandria hospital. Removal of spiculæ. Recovered; transferred to Co. I, 186th Pennsylvania Volunteers, and mustered out August 15th, 1865. Not a pensioner.

WASSURE, LOUIS, Corporal, Co. B, 27th Michigan, aged 22 years. Petersburg, July 30th, 1864. Depressed shell fracture of left parietal. Removal of fragments of skull at Ninth Corps hospital, by Surgeon W. C. Shurlock, 57th Pennsylvania Volunteers. Sent to DeCamp Hospital, and discharged for disability, February 1st, 1865.

MCCALL, JAMES, Corporal, Co. I, 144th New York, aged 23 years. Pocotaligo, December 9th, 1864. Fracture of left side of frontal by conoidal musket ball. Beaufort, Fort Schuyler, Troy, and Albany hospitals. Removal of fragments by Surgeon Hendrickson. Sent to be mustered out, June 17th, 1865.

BARTHOLOMEW, FRANCIS T., Corporal, Co. C, 1st West Virginia Cavalry. Culpeper, November, 1863. Gunshot fracture of frontal bone. Removal of fragments of bone. Discharged at Wheeling. February, 1867, Assistant Surgeon C. R. Greenleaf, U. S. A., examined the man and states that the wound has entirely healed. Not a pensioner.

GRIFFIN, ALBERT C., Private, Co. F, 107th Pennsylvania, aged 21 years. Gettysburg, July 1st, 1863. Gunshot fracture of right parietal bone by conoidal musket ball. Corps, Philadelphia, and Alexandria hospitals. Removal of small fragments of bone by forceps. Discharged December 29th, 1864. Not a pensioner.

ROE, JOHN, Private, Co. D, 31st Illinois. Jackson, September, 1862. Gunshot fracture of frontal and parietal bones by conoidal musket ball. Memphis and St. Louis hospitals. Fragments of both tables removed. Discharged February 3d, 1863. Not a pensioner.

LAFITTE, CHARLES, Sergeant, Co. A, 40th New Jersey, aged 36 years. Middletown, November 15th, 1864. Shell fracture of left parietal bone; also fracture of lower four ribs. Winchester, Frederick, and Washington hospitals. Removal of fragments of bone. Discharged May 30th, 1865. Not a pensioner.

O'RORKE, JOHN, Private, Co. C, 10th New York, aged 21 years. Spottsylvania, May 10th, 1864. Gunshot fracture of cranium. Washington hospitals. Bone splinters removed. Discharged. Not a pensioner.

DORR, JOSEPH, Corporal, Co. C, 12th Connecticut, aged 22 years. Cedar Creek, October 19th, 1864, Stellate fracture of parietal bone by conoidal ball. Frederick and Baltimore hospitals. Removal of depressed bone. Discharged September 21st, 1865. Not a pensioner.

Twenty-four patients, enumerated in the following series, recovered after removal of fragments of the skull, produced by gunshot fractures, and were either furloughed, retired, released, or exchanged. The first three cases were complicated by erysipelas:

CASE.—Private *Calvin Forest*, Co. G, 8th North Carolina Infantry, aged 18 years, was wounded at the battle of Cold Harbor, Virginia, May 31st, 1864, by a conoidal ball, which entered one inch above the left zygomatic process, passed through the left orbit, destroying the eye, and emerged from the inner wall of the right orbit, carrying with it the right eye. He was

admitted into the general field hospital on June 2d, and on the 10th he was transferred to the Lincoln Hospital, Washington, in a delirious condition. Erysipelas had attacked the wounds, and he suffered considerably. Five spiculæ of bone were removed daily. Simple dressings were used. Tonics were administered. The wounds gradually healed. There was a loss of the senses of taste and smell; but that of taste became almost entirely restored. He was transferred to the Old Capitol Prison, for exchange, on October 1st, 1864. Surgeon J. Cooper McKee, U. S. A., reports the case.

Case.—Private *J. W. Taylor*, Co. A, 34th Virginia Regiment, aged 33 years, received, on May 20th, 1864, a gunshot fracture of both tables of the occipital bone, near the posterior fontanelle. He was, on June 20th, admitted to Chimborazo Hospital No. 2, Richmond, Virginia. On admission, the wounds were erysipelatous; but some loose spiculæ of bone were removed, and the injury soon assumed a healthy appearance, and on July 24th the patient was allowed to go home for 60 days.

Case.—Private *W. C. Allen*, Co. E, 1st Georgia Infantry, aged 22 years, was admitted into the Confederate hospital at Charlottesville, Virginia, on August 27th, 1862, with a gunshot wound in the scalp, about an inch and a half above the zygomatic process, and half an inch anterior to the left ear. The wound was suppurating slightly, but there were no symptoms of serious injury to the skull or brain. The patient was walking about as if nothing was the matter, and eating heartily. The probe could not be introduced to the skull, the track of the wound being closed, probably by a firm clot, which had not been discharged by suppurative action. At the next examination, four or five days after his admission, the probe readily passed downward under the temporal muscle to the bone, which was found fractured and depressed, but to what extent could not be ascertained, except by cutting, which required a division of the swollen and puffy integument, and the temporal muscles in the vicinity of the fracture. A consultation was held, and an operation determined upon. The missile, a common musket ball, had been removed through the wound by a surgeon, shortly after the reception of the injury. On the 2d of September, the patient was chloroformed, and J. L. Cabell, surgeon in charge of hospital, made a crucial incision, two inches in length, in the scalp, and in doing so it was found necessary to apply ligatures to the temporal artery and one of its branches. When the flaps were dissected up, the fracture was found to be quite irregular, and as large as a twenty-five cent piece, while the fragments were driven in and pressing upon the dura mater. With considerable difficulty, thirteen pieces of bone were removed with the forceps, several of these being quite large, and grooved on the inner surface, showing the seat of injury to be directly over the middle meningeal artery. After removing all the pieces that could be felt with the fingers, the parts were drawn together by strips of adhesive plaster, and the wound was dressed with lint. The next day slight erysipelas made its appearance around the wound, involving the ear and side of the face, and nearly closing the left eye. Muriated tincture of iron, ten drops every two hours, were ordered, and the patient kept perfectly quiet. In twenty-four hours the erysipelas had disappeared, and from the third day after the operation, no unpleasant symptoms occurred, the wound suppurating finely, and closing rapidly, and this, too, with the patient going about the hospital more or less every day, as it was found impossible to keep him in bed. The treatment, after the disappearance of the erysipelas, consisted solely in the application to the wound of wet lint twice a day, and keeping it clean. By the 18th of September the wound had healed, except at the intersection of the two incisions. A small opening the size of a probe existed at that point, through which a slight discharge was kept up. The patient was discharged from the service on February 3d, 1863. The case is reported by Assistant Surgeon B. W. Allen, P. A. C. S.

Case.—Captain *T. J. Hadley*, Co. A, 3d Arkansas Regiment, received, near Petersburg, Virginia, July 16th, 1864, a gunshot fracture of the cranium, just in front of the junction of the occipital with the parietal bone. He was, on the following day, admitted to a hospital at Petersburg, and thence sent to Howard Grove Hospital, Richmond, where a section of both tables, one and a half inches in diameter, was removed. There was paralysis of the left side, from which the patient never fully recovered. He was retired from the service on December 13th, 1864, being permanently disabled for field service.

Case.—Sergeant *S. J. Baugston*, Co. I, 45th Georgia Regiment, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a fragment of shell, which fractured and depressed the outer table of the occipital bone on the right side. At different periods, several fragments of bone were removed with elevator and forceps. Loss of power in the extremities, headache, and vertigo followed, and, subsequently, spasmodical mental derangement supervened. He was admitted to the De Camp Hospital, David's Island, New York Harbor, July 19th, 1863; thence transferred to Bedloe's Island, October 24th; and on January 10th, 1864, sent to the Hammond Hospital, Point Lookout, Maryland. The wound had healed, and presented a depression about one and a half inches long by half an inch wide. His condition improved slowly, and in March, 1864, he had only occasional manifestations of mental aberration, with a decided disinclination to converse. On the 10th, he was sent to the provost marshal, and on the 14th was transferred for exchange. The case is reported by Acting Assistant Surgeon W. F. Buchanan.

Case.—Private *McCleary* was shot on October 19th, 1863, while trying to escape from prison at Point Lookout, Maryland, The missile, a pistol ball, struck the cranium just above the coronal suture, left side, causing a triangular-shaped depression of both tables, and glanced. He also received wounds of the liver and lung. On October 24th, he was admitted to the hospital at Point Lookout. There were no unfavorable symptoms; the wounds were filthy, but perfectly healthy; the secretions normal. It was stated that the patient had remained comatose for two days after the reception of the injury, but on admission he was perfectly rational and cheerful, and suffered no pain. The pulsations of the brain were visible. The wounds were cleansed, and simple dressings applied. In February, 1864, a piece of the skull, which had become detached, was removed. The wound healed rapidly, and April 27th, 1864, the man was sent to the provost marshal for exchange. For two or three weeks before his exchange, he had performed the duties of a nurse in the hospital.

Case.—Private *William B. Robertson*, Co. E, 48th Alabama Regiment, aged 26 years, received, at the battle of Antietam, Maryland, September 17th, 1862, a gunshot depressed fracture of the cranium at or near the right temporal ridge. No paralysis existed. He was admitted into the hospital at Charlottesville, Virginia, where he was operated upon on October

10th, at which time he had become much enfeebled. The scalp was undermined, the bone denuded around the fractured portion, and large quantities of pus were discharged daily. During the operation it was found necessary to use Hey's saw to release a large fragment of depressed bone. No unpleasant symptoms followed, and the patient finally recovered, with a large depressed cicatrix. He was discharged on March 23d, 1863. The case is reported by Assistant Surgeon B. W. Allen, P. A. C. S.

CASE.—Private *G. H. Sanford,* Co. A, 8th Georgia Regiment, aged 27 years, received, on August 28th, 1862, a gunshot depressed fracture of both tables of the superior portion of the left parietal bone. There was paralysis of the right side of the body, but the mind was clear. He was admitted into the Confederate hospital at Charlottesville, Virginia, and on September 23d was operated upon. All the pieces of bone were removed. Ten days after the operation, the paralysis had entirely disappeared. The patient improved rapidly, was furloughed soon after, and is believed to have recovered entirely. The case is reported by Assistant Surgeon B. W. Allen, P. A. C. S.

CASE.—Private *James D. Ferris,* Co. H, 18th Virginia Regiment, aged 18 years, was wounded at Hatcher's Run, Virginia, April 1st, 1865, by a conoidal ball, which fractured the parietal bones, the fracture extending from the coronal suture backward one and a half inches over the sagittal suture. He was taken prisoner, admitted into the hospital of the 3d division, Fifth Corps, and thence sent to the Lincoln Hospital, Washington, on the 8th. On April 20th, Surgeon J. C. McKee, U. S. A., removed several fragments of depressed bone. The wound healed rapidly, and the patient's general health remained excellent. On the 14th of June, he was released upon taking the oath of allegiance, having entirely recovered. The case is reported by the operator, Surgeon J. C. McKee, U. S. A. Vide *Photographs of Surgical Cases,* A. M. M. Vol. III, No. 17.

CASE.—Major *N. M. Norris,* 14th Tennessee Regiment, aged 30 years, was wounded at the second battle of Bull Run, Virginia, August 30th, 1862, by a musket ball, which struck the left side of the cranium a little in front of and on a level with the parietal protuberance, fractured the skull for about two and a half inches longitudinally and about one inch across, and lodged. The wound of scalp was still more extensive; the membranes were lacerated, and brain substance exuded. He was not examined by a surgeon on the field, as no one who saw him thought he would live beyond a few hours. The day following, a large piece of bone was removed, by his brother, with his fingers. The patient was perfectly unconscious for five days, and when, at the expiration of that time, consciousness returned, he was found to be paralyzed on the right side of the body. Three months after the reception of the injury, the ball and a large piece of bone were removed. Several smaller pieces were taken away or discharged at intervals, the last of them about four months after he was wounded. His general health had not been good for several months prior to the reception of the injury, having suffered from chronic diarrhœa. By July 1st, 1863, his paralysis was slowly getting better, and he was able to walk about with the assistance of a crutch. He could speak only with great difficulty, frequently forgetting what he was talking about, and stated that he could not read anything from inability to connect the words into a sentence. His appetite was good, and general health much improved. The wound was not entirely healed. There was a large cicatrized surface, covering a depression two and a half inches long and three-fourths of an inch wide, beneath which, when the head was inclined forward, the pulsations of the brain could be distinctly seen and felt. The case is reported by Assistant Surgeon B. W. Allen, P. A. C. S.

CASE.—Sergeant *John Moore,* Co. E., 38th Alabama Regiment, aged 24 years, was wounded in an engagement near Atlanta, Georgia, May 9th, 1864, by a musket ball, which entered just over the external canthus of the left eye, passed upward and backward, and lodged under the scalp, near the occipital protuberance, fracturing the skull in its whole course. He was admitted to the Institute Hospital, Atlanta, Georgia, on May 11th, being completely unconscious and unable to move his limbs; pulse feeble and 50, deglutition almost impossible, and the power of articulation almost entirely lost. There was great tumefaction and discoloration of the whole face and head. A scruple of calomel was with difficulty administered, which, on the following day, produced free purgation. On May 12th, he seemed to understand when spoken to, and on the following day could see a little out of the right eye. On the 16th, brain substance was sloughing out from the anterior wound. On the 19th, wounds discharged cerebral matter freely, and a soft tumor appeared near the posterior wound. Involuntary actions of the bowels occurred, the pulse became slow and feeble, and the patient was thought to be sinking. On the 16th, the abscess near the posterior wound opened and discharged freely. From that date his condition improved. On June 1st, he was partially conscious, and could articulate a few words. There was now well-marked hemiplegia of the right side. Several loose spiculæ of bone were removed. A gradual and steady improvement took place. On June 30th, his appetite was good; he could sit up in bed, and was rapidly gaining strength, but articulated imperfectly. The tumefaction had subsided, and revealed depressed bone to the extent of six inches in length by four in width. The wounds were open and suppurating. The case is reported by Surgeon D. C. O'Keefe, P. A. C. S.

CASE.—Private *L. B. Lovegreen,* Co. A. 25th South Carolina Regiment, was wounded in an engagement at Walthal Junction, Virginia, May 7th, 1864, by a conoidal ball, which struck the upper and receding portion of the frontal bone, left side, one inch from the median line; the outer table was fractured, the edges being roughened and irregular; the inner table was broken into several fragments varying in size. The wound was an inch wide and nearly an inch and a half in length, extending almost to the coronal suture. He was senseless for over an hour, but then recovered consciousness. The loose spiculæ were removed, simple dressings applied, and on the following day he was sent to Richmond. Pieces of bone were removed as they became separated. He was delirious more or less for three weeks; the wound looking unhealthy, with a tendency to sloughing. Poultices and disinfecting lotions were substituted for simple dressings. At the end of the fourth week, the case looked more favorable, and shortly afterward the patient was returned to South Carolina, the wound being still open and spiculæ of bone discharging from time to time; thirty-seven spiculæ came away in all. In July, 1865, a firm cicatrix had formed over the cavity. In March, 1866, the man was not equal to much physical exertion; he spoke slowly and with less fluency than before and suffered continually from hemicrania, most severe at the site of the wound and invariably brought on by bodily and mental exertion or exposure to the sun. Cannot indulge in stimulants. The case is reported by Surgeon F. S. Parker, P. A. C. S.

CASE.—Private *John McG———*, Co. C, 1st Maryland Regiment, aged 27 years, was wounded at the battle of Gettysburg, Pennsylvania, July 3d, 1863, by a conoidal musket ball, which fractured both tables of the left parietal bone. He was admitted into Seminary Hospital, Gettysburg, and thence transferred to Baltimore, and admitted into West's Buildings Hospital on the 28th. Partial hemiplegia of the right side existed, affecting both limbs to some extent. Simple dressings were applied and stimulants administered. On August 3d, Assistant Surgeon E. Brooks, U. S. A., removed fragments of bone to the extent of one and a half by three-fourths of an inch in surface, which had become detached. This greatly relieved the hemiplegia. By the 10th, the patient was able to walk about the ward and appeared to suffer no inconvenience except a little uncertainty and weakness in his gait. On August 31st, the wound was fast closing and discharging but very little. The patient ate and slept well and acted as nurse for some time. On November 12th, he was transferred for exchange; and, on the 16th, admitted into the Chimborazo Hospital, Richmond, Virginia. He had entirely recovered. The pathological specimen is No. 1719, Sect. I, A. M. M., and shows five necrosed fragments from the left parietal bone, removed by operation. The specimen and history were contributed by the operator, Assistant Surgeon E. Brooks, U. S. A.

Philips, T. M., Private, Co. I, 11th Alabama Regiment. Gettysburg, July 2d, 1863. Gunshot fracture of left parietal bone near vertex. Chester and Point Lookout hospitals. Removal of several fragments of bone. Exchanged March 3d, 1864.

Stiegel, Charles B., Co. H, 5th Virginia Regiment. Fort Steadman, March 25th, 1865. Fracture of right parietal by conoidal ball. Corps and Washington hospitals. Removal of fragments of depressed bones. Recovered, and released on taking the oath of allegiance.

Pellum, E., Private, of Holcomb's Legion. Near Charlottesville, September, 1862. Gunshot fracture of frontal bone. Treated at Charlottesville. Removal of loose fragments of bone, including portions of the orbital plate. Furloughed October 8th, 1862.

Toleman, William, Private, Co. L, 55th Virginia Regiment. Wilderness, May 6th, 1864. Gunshot fracture of external angular process of frontal bone. Field and Chimborazo Hospital. Removal of several pieces of bone. Furloughed June 23d, 1864.

Dixon, H., Private, Co. D, 30th North Carolina Regiment. Gunshot fracture, with depression of both tables of left parietal bone. Chimborazo Hospital. Removal of loose pieces of bone. Furloughed August 25th, 1862.

O'Rourke, Captain, 5th Louisiana. Maryland Heights, July 6th, 1864. Gunshot fracture of frontal bone by conoidal ball. Considerable brain matter escaped. Loss of consciousness, and convulsive movement of right side. Depressed bone elevated, and fragments removed. Result unknown.

Cook, M. S., Private, Co. C, 48th North Carolina, aged 23 years. Petersburg, September 16th, 1864. Fracture of right temporal by a conoidal ball. Removal of fragments. Farmville Hospital. Result unknown.

Sharp, Gordon, Private, Co. G, 6th Alabama. Gunshot fracture of cranium. Petersburg, April 2, 1865. Corps and City Point hospitals. Removal of spiculæ. Recovered.

Willingham, S. M., Private, Co. D, 5th Alabama, aged 25 years. Gunshot fracture of frontal bone, right side. Boonsboro', Maryland, September 14th, 1862. Philadelphia and Charlottesville hospitals. Removal of fractured bone. Recovery.

Cogan, Tobias, Private, Co. B, 19th Virginia Cavalry. Winchester, Virginia, August 20th, 1864. Gunshot fracture of frontal bone by conoidal ball. Winchester and Baltimore hospitals. Removal of fragments of bone. Exchanged.

Damron, I. T., Private, Co. H, 18th South Carolina Regiment. Gunshot fracture of frontal bone. Charlottesville hospital. September 6th, 1862. Removal of several pieces of bone. Furloughed October 8th, 1862.

In three cases of removal of fragments from the cranium, it has been impracticable to trace the histories to a conclusion. They probably were all three examples of recovery:

WILSON, T., Private, Co. D, 5th United States Cavalry, aged 28 years, was wounded at Brandy Station, Virginia, June 9th, 1863, by a musket ball, which fractured the left parietal protuberance, about four inches above the ear. He was insensible for several days, and partially paralyzed on the right side. He was taken prisoner, and conveyed to Confederate hospital at Charlottesville, Virginia, where, on June 13th, the ball and pieces of bone were removed. On July 6th he was apparently doing well, and the wound healing. He never complained of pain in the head, but had a constant numbness and pain in his right arm, with partial loss of its motions. But this was rapidly improving, and he bade fair to recover entirely. The case is reported by Assistant Surgeon B. W. Allen, P. A. C. S.

CASE.—Corporal Theodore Boese, Co. K, 1st New Jersey Volunteers, was, on August 13th, 1863, admitted to Ladies' Home Hospital, New York, with a wound of the head. On examination, the bone was found to be depressed. Several spiculæ were removed, when all bad symptoms disappeared; but his memory remained impaired, and at times he would experience severe pains in the region of the wound. He deserted November 1st, 1863.

CASE.—Frederick R———, 43d Illinois Volunteers, received, at the battle of Shiloh, April 6th, 1862, a gunshot fracture of the parietal bone, near its posterior superior angle. The loose pieces of bone were carefully removed, the flaps adjusted, warm water dressings applied, and opiates freely administered. In about three weeks a cartilaginous substance commenced to be deposited in the space from which the fragments had been removed. This substance became to some extent ossified, and in about six weeks the wound had entirely healed. The case is reported by Assistant Surgeon S. B. Houts, 18th Missouri Volunteers.

Fatal Cases of Gunshot Fractures of the Skull treated by the Removal or Elevation of Fragments.—The following series of fatal cases of gunshot injuries of the skull treated by operation, but not by formal trephining, comprise, perhaps, more instructive instances than the series of cases of recovery, inasmuch as the extent of the injury could be ascertained with precision, and the organic alterations ensuing accurately observed. Extravasation of blood within the cranium was the cause of the rapidly fatal termination of several of these cases:

Case.—Sergeant *D. A. K*———, Co. D, 25th South Carolina Regiment, was wounded at Six Mile House, Virginia, August 21st, 1864, by a conoidal ball, which caused a depressed fracture of the frontal bone. He also received flesh wounds of the right arm, left fore-arm and hip. Soon after the reception of the wound, he was sent to the hospital of the 3d division, Fifth Corps, where eight fragments of bone were removed from the vault of the cranium, on the day of his admission, by Surgeon E. G. Chase, 104th New York Volunteers. But the symptoms of compression were not relieved, and the patient gradually sank into a comatose state and died August 23d, 1864, from effusion of blood over the brain. Six of the removed fragments are represented in the adjacent wood-cut, and were contributed, with the history of the case, by the operator.

Fig. 116.—Fragments of skull removed for depression from gunshot fracture of the right parietal. *Spec.* 4744, Sect. I, A. M. M. [Nat. size.]

Case.—A soldier, supposed to be John R———, Co. D, 9th Massachusetts Volunteers, aged 22 years, was admitted into the Stanton Hospital, Washington, on May 18th, 1864, having been wounded five or six days previously by a conoidal ball, which entered the left side of the frontal bone, three-quarters of an inch above the frontal protuberance, and lodged in the brain. He was in a comatose condition; his respirations were sighing, pulse 110 and feeble, pupils dilated, and his right side was paralyzed. Assistant Surgeon George A. Mursick, U. S. V., enlarged the wound of soft parts by crucial incision, and removed four splinters of bone with an elevator, one of them being depressed about half an inch. An ice bag was applied to the head and a stimulating enema ordered, but the patient sank rapidly and died May 19th, 1864, ten hours after the operation, from extravasation of blood. The autopsy showed the anterior lobe of the left cerebrum to be injured. There was a copious exudation of plastic matter between the dura mater and the arachnoid. The specimen is No. 2681, Sect. I, A. M. M., and was contributed, with the history, by Assistant Surgeon George A. Mursick, U. S. V.

Case.—Private William B———, Co. G, 8th Pennsylvania Cavalry, aged 18 years, was wounded in an engagement at Deep Bottom, Virginia, August 14th, 1864, by a conoidal ball, which fractured and depressed the posterior portion of both tables of the right parietal bone. The ball, which was split from apex to centre, was found impacted on the edge of the fracture and was removed on the field. He was admitted, on the following day, to the hospital of the 2d division, Cavalry Corps, and thence conveyed to Washington, where he entered the Emory Hospital, August 17th. Cold water dressings were applied, the head kept cool by constant application of iced water, and low diet ordered. On the morning of the 20th, there were symptoms of compression; pulse 88, slow and soft. Chloroform was administered and Surgeon N. R. Moseley, U. S. V., removed five small fragments of bone which had become detached, and elevated the depressed bone. The soft parts were quite extensively lacerated. A strictly antiphlogistic course of treatment was established, and the patient remained comfortable until the evening of the 23d, when febrile symptoms of a severe character occurred; death supervened on August 25th, 1864. An autopsy showed extensive disorganization of the brain; the middle lobe of right hemisphere was in a suppurating condition, and the diseased action had extended as far back as the base of the brain. The pathological specimen is shown in the wood-cut, and was contributed by the operator, Surgeon N. R. Moseley, U. S. V.

Fig. 117.—Split ball and fragments of right parietal. *Spec.* 3131, Sect. I, A. M. M. [Nat. size.]

Case.—Corporal Henry F. M———, Co. G, 39th Massachusetts Volunteers, aged 19 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 12th, 1864, by a conoidal musket ball, which penetrated the right frontal and parietal bones and lodged in the brain. He was admitted to the 3d division, Second Corps, hospital, and on the 18th, transferred to the Stanton Hospital, Washington. His intellect was confused, but he would answer questions intelligently when spoken to in a loud voice. His left side was paralyzed; respiration sighing; pulse 120 and full. He complained of intense pain in his head, and had purulent conjunctivitis of both eyes, with rupture of the cornea of the left eye. Deglutition was unimpaired. On May 19th, Assistant Surgeon George A. Mursick, U. S. V., enlarged the wound by crucial incision, and removed the depressed bone with an elevator. Ice was applied to the head, a stimulating enema, fluid extract of aconite, and an astringent lotion for the eyes, ordered. On the 20th, coma supervened and deglutition became difficult On the 22d, his breathing was stertorous, with puffing of the corners of the mouth. The comatose condition continued without interruption until the day of his death, May 25th, 1864. At the autopsy, the ball was found lodged in an abscess in the posterior lobe of the right hemisphere. Purulent deposit between the dura mater and the arachnoid extended over the whole hemisphere. The pathological specimen is No. 2680, Sect. I.

A. M. M. A segment of cranium fractured at the coronal suture. Five fragments of bone, chiefly from the inner table, are attached. The opening externally measures one-half by one inch, the edge being beveled internally. The specimen and history were contributed by Assistant Surgeon G. A. Mursick, U. S. V.

Case.—Private *T. M. J*———, Co. H, 45th North Carolina Regiment, aged 38 years, was wounded at Silver Spring, near Washington, July 12th, 1864, by a conoidal ball, which entered at the middle of the superior border of the right temporal bone, and passing transversely, fractured both tables of the skull. He was taken prisoner and conveyed to the Lincoln Hospital, Washington, on the 17th, being conscious at the time. On the 27th, the wound was enlarged and fragments of bone were removed. The wound was in a healthy condition, and the patient's pulse full and regular. Convulsions, followed by paralysis of the right side, succeeded the operation. These symptoms continued until the 29th, when he became comatose. Mercurial purgatives, cold applications, friction and sinapisms to the extremities, were used without avail. The patient sank rapidly, and died on the 29th. The *post-mortem* examination revealed a fragment of bone, about one inch in diameter, lying upon the brain substance. An abscess existed about the size of an English walnut. The brain substance of the right lobe was much softened and congested, and the ventricles were filled with serous fluid. The vault of the cranium was preserved, and is figured in the wood-cut. Fragments have been removed from an elliptical space, measuring one by one and one-fourth inches. The posterior half of the sagittal suture is separated, and five fissures radiate from the fractured point. The edges of the opening are necrosed, cribriform, and crumbling. The specimen and history were contributed by Acting Assistant Surgeon T. L. Leavitt.

Case.—Sergeant Joseph C———, Co. B, 3d Pennsylvania Cavalry, was wounded at the battle of Mine Run, Virginia, November 27th, 1863, by a conoidal musket ball, which entered above the right zygoma and penetrated the skull. He was treated in the field hospital until December 4th, when he was conveyed to Alexandria and admitted to the 3d division hospital. Delirium had supervened, which continued until within twelve hours of his death. Several fragments of bone were removed, but the patient was unable to take food, and drank but two or three times of whiskey and water. He became comatose, and died on December 5th, 1863. At the autopsy, the right lobe of the cerebrum was found to be completely destroyed. The pathological specimen is No. 2641, Sect. I, A. M. M. The perforation is at the centre of the squamous suture, and measures three-fourths of an inch by one inch externally, having the edges beveled at the expense of the inner table. There is no fissuring. The specimen and history were contributed by Surgeon E. Bentley, U. S. V.

Case.—Private Foster H. B———, Co. E, 7th Michigan Volunteers, aged 20 years, was wounded at Ream's Station, Virginia, August 25th, 1864, by a conoidal ball, which fractured and depressed the frontal bone over the left orbit, tearing off a portion of the external table two and a quarter inches in length, and nearly an inch in width. In the same engagement he received a flesh wound of thigh. He was taken to the 2d division, Second Corps, hospital, where a portion of both tables was removed by Surgeon G. Chaddock, 7th Michigan Volunteers. On the 28th, he was conveyed to Washington, and admitted to the Lincoln Hospital. Two days later he became delirious. Coma supervened on September 1st, and the pupils contracted. On the 3d, while the coma still existed, Acting Assistant Surgeon T. F. Betton made an elliptical incision through the integuments, and removed a portion of a musket ball and several depressed fragments of bone from the anterior lobe of the brain. The wound was cleansed, and the edges brought together and united by straps of adhesive plaster. The operation failed to relieve the coma, and patient died the same day. The *post-mortem* examination revealed a portion of the inner table, about the size of a dime, depressed; the meninges of the brain were bathed in pus, and a large abscess existed in the anterior portion of the left hemisphere, the substance of the brain surrounding it being very much softened. The pathological specimen is No. 2078, Sect. I, A. M. M,. and was contributed, with the history, by Acting Assistant Surgeon H. M. Dean.

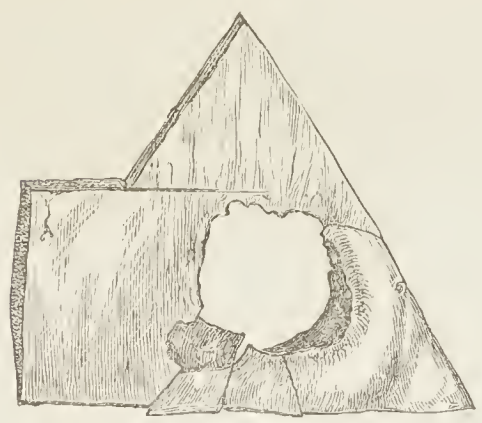

Fig. 118.—Segment of left temporal bone, from which fragments have been removed. *Spec.* 1824, Sect. I, A. M. M. [Two-thirds size.]

Case.—Sergeant Presley W. N———, Co. C, 1st Ohio Volunteer Cavalry, aged 24 years, was wounded near Culpeper, Virginia, September 13th, 1863, by a musket ball, which comminuted both tables of the left temporal bone two inches above the mastoid process. He was conveyed to Washington, and admitted into Armory Square Hospital on the 15th, where simple dressings were applied to the wound. The head symptoms were very slight until October 7th; from that time he gradually grew worse. On the 17th, nausea and vomiting supervened. An incision was made over the cicatrix by Surgeon D. W. Bliss, U. S. V., and several small spiculæ of bone were removed, which, however, afforded no relief, and the vomiting, with increased pain in head, continued. The patient sank rapidly, and died on the 20th. The *post-mortem* examination revealed the vessels of the membranes and of the brain in a high state of congestion. An abscess was found in the left ventricle, which communicated with the external wound, and contained an ounce of dark, greenish pus. The substance of the brain in the vicinity of the abscess was softened. Communication existed between the external wound and the abscess, which was filled with spiculæ. The pathological specimen is represented in the adjacent wood-cut. The edges of the fracture in the cranium are somewhat rounded, exhibiting evidence of attempts at repair. The specimen and history were contributed by Surgeon D. W. Bliss, U. S. V.

Case.—Private Otis G———, Co. C, 16th Maine Volunteers, aged 21 years, who was a very stout and vigorous person, weighing 180 pounds, was struck, at the affair on the Weldon Railroad, August 18th, 1864, upon the top of the head by a conoidal musket ball, which produced a fracture of the skull one inch posterior to the coronal suture. On the following day he was admitted into the field hospital of the 3d division, Fifth Corps, where he remained until the 21st, when he was conveyed to Washington, and admitted into the Lincoln Hospital. Ice-water dressings were applied to the head, and sedatives were administered. In the progress of the case, fragments of both the outer and inner tables were removed, leaving the brain exposed.

The patient failed rapidly, and died apparently from exhaustion on August 30th, 1863. At the autopsy, the scalp in the vicinity of the wound was found to be infiltrated with pus, the periosteum being easily detached. The fracture involved both parietal bones, measuring one-half by one inch, the longest diameter running at right angles with the sagittal suture. Upon the removal of the calvarium, the depressed portion of bone was held in position by the dura mater. Through both tables of the left parietal bone, from the place of injury to the posterior inferior angle, ran a fissure, along which traces of an attempt at repair were observed. The meninges in the vicinity were congested and thickened. In the left hemisphere a cerebral abscess existed, extending from the surface of the brain to a level with the corpus callosum, three-fourths of an inch in diameter. The contiguous portion of brain was much softened, as was the right hemisphere within the limits of the fracture. The pathological specimen is No. 3150, Sect. I, A. M. M., and was contributed by Acting Assistant Surgeon H. M. Dean.

Case.—Corporal William M———, Co. E, 23d Pennsylvania Volunteers, was wounded at the battle of Malvern Hill, Virginia, July 1st, 1862, by a fragment of shell, which fractured and depressed the right parietal bone, about one inch from the sagittal suture. He was conveyed to New York, and on the 24th admitted into the DeCamp Hospital, David's Island, New York harbor. Hemiplegia of the right side of the body existed from the date of the injury; but with this exception no unfavorable symptoms appeared until August 15th. On the following day two pieces of necrosed bone, about an inch and a half in diameter, and also portions of depressed bone, were removed with the forceps. A very fetid pus surrounded the fractured parts. The patient was delirious, grew rapidly worse, and died August 17th, 1862. The autopsy revealed an abscess about two inches in extent, seated in the left hemisphere of the brain, immediately below the seat of the injury. The pathological specimen is No. 1059, Sect. I, A. M. M., and consists of a portion of the cerebrum, with a small abscess in the upper part of the anterior lobe of the right hemisphere. On the external surface of the brain, one-half inch to the right of the longitudinal fissure, is a dark spot, with disorganization of the brain substance, and the surrounding parts are discolored. The case it reported by Surgeon S. W. Gross, U. S. V.

Case.—Private James F. W———, Co. H, 3d Maine Volunteers, aged 24 years, was wounded at Raccoon Ford, Virginia, November 27th, 1863, by a musket ball, which fractured both tables of the occipital bone, just above and to the left of the protuberance. He was admitted to the 1st division, Third Corps, field hospital on the same day, and transferred to the 3d division hospital, Alexandria, Virginia, on December 4th. On the following day he was still conscious, but very restless; his head was very painful, pulse 120, strong and full, tongue coated and dry, skin hot and bowels constipated. During the night he was delirious, and vomited often, and on the next morning he became comatose. A piece of bone, one inch long and three-fourths of an inch wide, was removed from the wound, but failed to relieve the patient, and he died at twenty minutes after three o'clock P. M. of the same day. The autopsy revealed a congested and discolored state of the meninges, and an abscess extending from the wound into the left lateral ventricle. Several small spiculæ were lying loose in the wound. An opening was found near the middle and a little to the left of the centre of the occipital bone, through which a portion of the brain was protruding. The pathological specimen is No. 1904, Sect. I, A. M. M., the posterior portion of the cranium showing a nearly circular fracture of both tables. The internal surface of the opening, which measures one inch in diameter, is slightly the larger. The specimen and history were contributed by Acting Assistant Surgeon J. Cass.

Case.—Private Peter W———, jr., Co. F, 126th New York Volunteers, aged 19 years, was wounded at Bristow Station, Virginia, October 14th, 1863, by a conoidal musket ball, which fractured and depressed the inferior angle of the left parietal, at its junction with the frontal bone, and penetrated the brain. He was admitted into the 2d division hospital, Alexandria, on the 15th, in a state of insensibility. His right side was paralyzed, pulse 56 and full, and the pupils were somewhat contracted. On the 16th seven pieces of bone were removed; the largest being nearly an inch square. A large quantity of sanguinolent fluid was discharged, in which appeared portions of brain matter. The next morning a discharge of a bloody, foul-smelling fluid followed, and the patient passed his urine involuntarily. On the 18th the discharge continued; the pulse became more frequent and feeble, and death occurred at two o'clock A. M., October 19th, 1863. The *post-mortem* revealed inflammation of the membranes over both hemispheres; also an abscess occupying the upper half of left hemisphere of the cerebrum, at the posterior part of which was found a rifle ball. The pathological specimen is No. 1739, Sect. I, A. M. M. The depressed portion measures one by one and a half inches, from which four fragments have been removed. A fissure extends diagonally across the parietal bone, from the anterior inferior to the opposite angle, and another fissure passes downward. The specimen and history are contributed by Acting Assistant Surgeon C. P. Bigelow.

Case.—Private Warren W———, Co. A, 159th New York Volunteers, aged 26 years, was wounded in the action at Irish Bend, Louisiana, April 14th, 1863, by a conoidal musket ball, which cut the scalp upon the right side of the head, one inch and a half in extent, so that the belief was entertained that the wound had been produced by a fragment of shell. Violent delirium succeeded rapidly, as reported by the field surgeon who had charge of the case previous to his admission into the University Hospital at New Orleans, April 17th, 1863. An examination of the wound was now made with a probe, which penetrated the brain by its own weight to the distance of four inches. On the following day he was restless, moaned, and complained of pain in the head, and toward evening active delirium supervened, which subsequently alternated with periods of quiet consciousness. Spasms, however, occurred at all times. On the eleventh day after the injury a fragment of bone was discharged from the wound, after which he seemed quite rational. But delirium soon returned, followed by coma, and death resulted on the morning of April 27th, 1863. At the autopsy, the space from which fragments of bone had been removed, at the posterior inferior angle of the parietal bone, measured one and one-fourth inches in length by three-fourths of an inch in width, the edges of the opening being beveled at the expense of the inner table; a fissure through both tables passed forward to the squamous suture. One fragment of the inner table was depressed two lines, but remained attached. The inner table in the vicinity of the fracture, exhibited evidences of extensive disease. The cerebral substance immediately surrounding the missile, which was flattened and battered, was disorganized; otherwise the brain appeared healthy. The pia mater appeared much congested, and the ventricles contained a small quantity of fluid. The pathological specimen is No. 1292, Sect. I, A. M. M., and was contributed, with the history, by Assistant Surgeon P. S. Connor, U. S. A.

CASE.—Private *Henry G*———, Co. B, 53d North Carolina Regiment, aged 30 years, was wounded at the battle of Gettysburg, July 1st, 1863, by a conoidal musket ball, which penetrated the skull at the left parietal eminence, causing a depression of the fragments. The fractured parts were removed on the field. He was admitted to the Frederick Hospital, Maryland, on the 6th, being nearly insensible, and only muttering in reply to questions addressed to him. The pupils, however, were sensible to light; softened brain, mixed with blood, was oozing from the wound. Death supervened on the afternoon of the following day. At the autopsy, two rather large pieces of skull were found protruding inward from the wound in such a way that the ball could have lodged just within the aperture. The missile had evidently been removed. The pathological specimen is No. 3861, Sect. I, A. M. M. The fractured portion measures externally one inch in diameter, internally one and one-fourth inches. More than half the fractured surface is removed; the remainder is composed of the outer table only, and is depressed one-fourth of an inch. The specimen and history were contributed by Acting Assistant Surgeon J. H. Bartholf.

CASE.—Corporal Joseph D. T———, Co. F, 27th Indiana Volunteers, was wounded at the battle of Chancellorsville, May 3d, 1863, by a round ball, which struck the frontal bone, penetrated both tables, and lodged in the right ventricle. He was admitted into the Twelfth Corps hospital, Aquia Creek, Virginia, on May 16th. He had received no surgical treatment up to that date, but was sufficiently strong to walk from the ambulance to the tent. On the next morning he became partially comatose, but exhibited no other symptoms of cerebral lesion, except slight headache. The pulse was natural, and the skin cool and moist. Assistant Surgeon Andrew J. Gilson, 5th Connecticut Volunteers, removed five fragments of bone from the wound, giving exit to considerable pus, mixed with clots of blood and pieces of membrane. After the operation the patient expressed himself relieved, but he was still inclined to sleep. Cold water dressings were constantly applied and frequently renewed. No material change took place until the 21st, when the ball appeared at the orifice of wound, and was removed. Partial hemiplegia and complete coma supervened; the patient gradually became exhausted, and died at nine o'clock P. M., May 21st, 1863. The autopsy revealed a compound fracture of right parietal and frontal bones. The brain substance was extensively lacerated, crushed, and in a state of putridity; over the right orbit the track of ball was found leading to the right ventricle, which was filled with pus. The missile was expelled by the action of the escaping pus. The cerebellum was inflamed and congested. The pathological specimen is No. 1267, Sect. I, A. M. M., and was contributed by Assistant Surgeon A. J. Gilson, 5th Connecticut Volunteers.

CASE.—Captain *X.* ———, a Confederate officer, was admitted into Stanton Hospital, Washington, on May 18th, 1864, in a comatose condition. He had been wounded at Spottsylvania on the 12th by a conoidal ball, which perforated the frontal bone to the right of the median line. The dura mater was penetrated, and several splinters were driven into the brain. On May 19th, he was still in a comatose condition; the pupils widely dilated; breathing stertorous, with puffing of the corners of the mouth; right side and bladder paralyzed; pulse 108, and full; deglutition difficult. Assistant Surgeon George A. Mursick, U. S. V., enlarged the wound by a crucial incision, and removed several large splinters with an elevator. Ice was applied to the head, and a stimulating enema was ordered, and the urine was drawn off by a catheter. On the following morning the coma was yet more profound, and the patient died during the day, May 20th, 1864. At the autopsy, the right frontal and temporal bones were found to be fissured, the fracture of the temporal bone extending nearly to the ear. A conoidal ball was found in the middle lobe of the right hemisphere; also a plastic exudation on the vertex, between the dura mater and the arachnoid. The pathological specimen is No. 2683, Sect. I, A. M. M. The opening in the frontal bone is elliptical, measuring three-fourths by one and one-half inches. The fractured surface of the inner table is the larger. The specimen and history were contributed by Assistant Surgeon George A. Mursick, U. S. V.

CASE.—Private Charles B———, Co. H, 2d Michigan Volunteers, aged 36 years, was wounded near Petersburg, Virginia, June 17th, 1864, by a shell, which fractured the left parietal bone at the middle of the lower edge. He was admitted into the field hospital of the 3d division, Ninth Corps, and thence sent, on June 21st, to the Harewood Hospital, Washington, D. C. On June 26th, fragments of the outer table to the extent of an inch in diameter were taken out, and, on June 29th, a fractured portion of the inner table, which had become loose, was removed. There being some cerebral symptoms, ice was applied to the head; cathartics were then administered, and poultices applied. Coma supervened on June 30th, 1864, and the patient died on the same day. A *post-mortem* examination revealed meningitis and a considerable amount of pus beneath the membranes. The pathological specimen is No. 3051, Sect. I, A. M. M., a segment of cranium showing an elliptical opening one inch from above downward and one-half inch in width; there is a short fissure of the inner table, with depression of one edge to the extent of one line. No attempt at repair is visible. The specimen and history were contributed by Surgeon R. B. Bontecou, U. S. V.

CASE.—Corporal James D. M———, Co. D, 108th New York Volunteers, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a conoidal ball, which lacerated the scalp over the upper anterior portion of the left parietal bone. He was admitted into Grace Church Hospital, Alexandria, on the 19th, where the wound was diagnosticated as a gunshot wound of the scalp. He was able to walk about, and stated that he had been unconscious only a short time. After a few days he was attacked with convulsions, which affected only the right side, producing tonic spasms, only lasting about one hour. He recovered from these sufficiently to be again able to walk about. About the 18th or 19th of January, 1863, the convulsions returned and grew more frequent, until he sank into a comatose state, with constant rigidity of the right side. He could be aroused sufficiently to answer questions by yes and no. The right pupil was dilated, and the pulse slow and intermitting. Acting Assistant Surgeon A. W. Tryon, cut down on the skull and removed several pieces of bone, one of which, triangular in shape, and about half an inch in length, had been driven into the brain matter. The operation afforded no relief, and the symptoms above described gradually increased, till death supervened on January 30th. At the *post-mortem* examination an immense abscess was found, which occupied nearly the whole anterior lobe of the left hemisphere, and penetrated into the ventricle of that side. The septum lucidum was broken down, and the right ventricle filled with pus. The under portions of the meninges of the brain were inflamed, being much injected with blood. At a number of places pus had formed under the arachnoid. There were congested spots in the brain matter, about the sac of the abscess, and nearly the whole mass of brain

matter was much softer than natural. The pathological specimen is No. 1723, Sect. I, A. M. M. The vault of the cranium is fractured just below the anterior superior angle of the left parietal bone. Fragments have been removed from an opening three-fourths of an inch in diameter. Two fragments of the outer and inner tables remain attached, being depressed two lines on the free edge. The surrounding bone is soft and porous. The specimen and history were contributed by Acting Assistant Surgeon A. W. Tryon.

CASE.—Private Norman O———, Co. E, 44th New York Volunteers, aged 37 years, was wounded at the battle of Chancellorsville, May 1st, 1863, by a musket ball, which penetrated the frontal bone an inch anterior to the coronal suture, and a little to the right of the median line, fracturing both tables of the skull. While he was lying upon the field, Assistant Surgeon John S. Billings, U. S. A., removed several fragments of bone, together with a metallic figure 4, about half an inch in length, which had been driven from the front of his forage cap into the substance of the brain. There was considerable discharge of arachnoid fluid. On the next day he was removed to the Fifth Corps hospital at Brooks's Station. The brain pulsations were distinctly visible. The patient was perfectly rational, conversing freely, and complaining of hunger. No pain in the head was experienced, nor any functional cerebral derangement. Water dressing was applied, and perfect quiet enjoined. On the 10th, suppuration was free and healthy. The patient then complained of great inconvenience from a rattling sound in the head, which could be heard at a distance of several paces from the bed, and which was synchronous with the brain pulse, being apparently caused by the vibrations of pus at each pulsation. On May 12th, the pulse was 136 and strong, and the patient complained of considerable pain in the head. Ice was applied to the wound, and tinct. veratri virid. given every hour, which, in about twenty hours, reduced the pulse to 80. He was somewhat stupid and sleepless, had involuntary discharges, and slight paralysis of left arm and leg, though no diminution of sensibility existed. The wound still suppurated freely. Patient was occasionally turned on his face, to allow the pus to drain from the wound. The paralysis and stupor increased gradually until May 20th, when difficulty in micturition was observed; delirium set in, and continued with only occasional intermissions. On the 25th, paralysis of left side had become complete. The right side of face was partially paralyzed, the pulse extremely irregular, and the vision entirely gone. These symptoms increased in gravity until the 27th, when the patient died in a somnolent but not comatose condition. The *post-mortem* revealed an adhesion of the dura mater to the brain matter, and also to the skull around the orifice. An abscess was found, extending from the opening through the right anterior lobe of cerebrum; also, pus on the cribriform plate and around the optic foramina. No traces of the ball were discovered. The pathological specimen is figured by the wood-cut. The opening in the frontal bone is elliptical, and measures one-half by one inch, and is surrounded by a ring of bone in process of separation; the line of demarcation having formed. The specimen and history were contributed by Surgeon A. M. Clark, U. S. V.

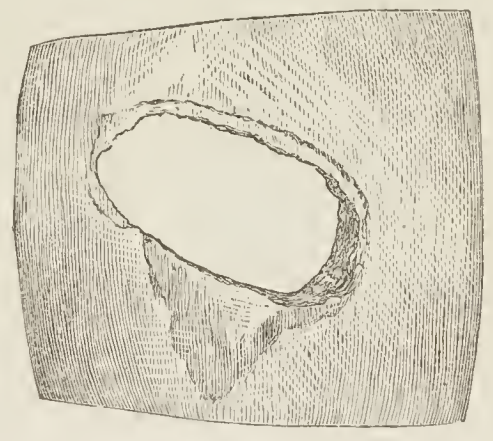

FIG. 119.—Segment of frontal bone, showing exfoliation about a gunshot perforation. *Spec.* 1196. Sect. I, A. M. M. [Nat. size.]

CASE.—Private Gottleib S———, Co. E, 122d New York Volunteers, was wounded at the battle of Cold Harbor, Virginia, June 4th, 1864, by a conoidal musket ball, which fractured the frontal bone at the coronal suture, just behind the left frontal eminence. He was admitted to the hospital of the 1st division, Sixth Corps, and on June 7th, sent to Lincoln Hospital, Washington. On the following day, the ball and fragments of bone were removed, leaving the dura mater exposed. On June 9th, erysipelas supervened, and death occurred on June 10th, 1864. On opening the scalp at the autopsy, one and a half ounces of blood exuded; the dura mater beneath the injury was firmly covered with blood clots; the left hemisphere of the brain was much congested, and the injured part down the corpus callosum so much contused as to resemble boiled chocolate. The pathological specimen is No. 2539, A. M. M. The opening in the bone is an inch in diameter, the amount of the vitreous table removed being the greater. The ball is traversed by a broad, deep groove from point to base. The specimen was contributed by Assistant Surgeon J. C. McKee, U. S. A.

CASE.—Private Edward F———, Co. K, 47th Pennsylvania Volunteers, was wounded at the battle of Pocotaligo, South Carolina, October 22d, 1862, by a musket ball, which divided the central and posterior portion of the scalp, penetrated and lodged in the frontal bone. He was admitted into the general hospital at Hilton Head on the following day, when the missile was removed. The wound did well for three weeks, when erysipelas set in. It disappeared under appropriate treatment. Suppuration commenced and spiculæ of bone came away, or were removed at various times. Constant headache, of a dull, heavy nature, was present. The wound closed, and no uneasiness was experienced except upon exposure to the rays of the sun. He was returned to duty on November 19th, 1862. About February 4th, he was admitted into the Fort Jefferson Hospital, Tortugas, Florida, with marked symptoms of compression. The pupils were slightly dilated; pulse 75, and of moderate volume; severe headache, and alternate flashes of heat; anorexia. The tongue was covered with a heavy white fur. The bowels were torpid. Blisters were applied to the nape of the neck, and a cathartic given. He gradually grew weaker, notwithstanding the administration of tonics. Opiates were given to promote sleep. Partial paralysis of the lower extremities took place. His mind remained clear until about thirty-six hours before death. A comatose condition gradually set in, his pupils became much dilated, and he expired on February 16th, 1863. The *post-mortem* revealed a slight congestion of the membranes and a slight depression of osseous matter beneath the seat of injury. An abscess was found in the left posterior lobe of the cerebrum, which contained about eight ounces of dark colored and very offensive pus. The sides of the cavity were lined by a yellowish white membrane, which was readily broken up by the fingers. The left anterior lobe was in a normal condition. The case is reported by Assistant Surgeon I. H. Scheetz, 47th Pennsylvania Volunteers.

CASE.—Private Simon Kessler, Co. E, 9th New York Heavy Artillery, aged 22 years, was wounded at Petersburg, Virginia, April 2d, 1865, by a conoidal ball, which fractured the occipital bone near its centre and penetrated the brain; he also received a slight flesh wound over the right scapula. He was, on the next day, admitted to the hospital of the Sixth Corps, and thence transferred to the Lincoln Hospital, Washington, on the 8th. On the 10th, the patient had become slightly comatose. He was placed under the influence of ether, and Acting Assistant Surgeon W. B. Chambers made a vertical incision through the integument and removed the ball and fragments of bone, including the occipital protuberance. Cold water dressings and lead and opium wash were applied and quinine and iron administered. Traumatic erysipelas supervened, and death resulted, on April 18th, from exhaustion. A *post-mortem* examination showed extensive comminution of bone. The posterior portion of brain was much congested. The case is reported by Assistant Surgeon J. C. McKee, U. S. A.

CASE.—Private *P. C. Schools*, Co. E, 40th Virginia Regiment, P. A. C. S., aged 41 years, was admitted into Confederate Hospital No. 12, Richmond, Virginia, on the 12th of May, 1863. He had been wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a shell, which fractured and depressed the right parietal bone, and also fractured one of the metacarpal bones of the right hand. On admission, paralysis of the left side existed and his bowels had not been moved for two weeks. Calomel and purgative enemata were given. On May 20th, Drs. Campbell and Petacolas removed several loose pieces of bone through incisions in the scalp. After the operation coma supervened, followed by erysipelas of scalp and face. Pounded ice was applied to the head, purgative enemata ordered, and tincture of iodine applied locally. Death occurred on May 25th, 1865.

CASE.—Private *Harrison H———*, Co. E, 53d North Carolina Regiment, aged 29 years, was wounded in the engagement near Washington, D. C., July 12th, 1864, by a conoidal ball, which entered in front of the right branch of the coronal suture, traversed the brain, fractured the posterior angle of the right parietal bone two inches from the occipital protuberance, and lodged beneath the scalp. He was, on July 14th, admitted to the Lincoln Hospital. Brain substance, in a disorganized condition, oozed from the wound. Cold water dressings were applied, and calomel, opium, cathartics, and low diet ordered. On July 19th, the patient rejected all food, became unconscious, and groaned as if in much pain. He was attacked by frequent and severe convulsions, and evacuated urine involuntarily. At times there were lucid intervals of short duration. Strabismus to a marked degree existed. On July 22d, he had improved a little, and on July 24th free incisions were made to evacuate a large amount of pus. The missile and several fragments of the parietal bone were also removed. He continued to improve until July 27th, when hæmorrhage occurred from branches of the meningeal artery, which was arrested by compress. He was now perfectly conscious, but complained of weakness. On the following day convulsions recurred, and continued with increased severity, until death occurred on July 28th, 1864. The autopsy revealed extensive comminution of the right parietal bone in the track of the ball, which was six inches in length; the posterior part of the right lobe of brain was protruding, and in a state of disorganization; the anterior portion was apparently healthy; the pericranium was much thickened and congested. The case is reported by Acting Assistant Surgeon T. L. Leavitt. The pathological specimen is No. 2905, Sect. I, A. M. M., and was contributed by Acting Assistant Surgeon H. M. Dean. Between the wounds of entrance and exit is a bridge of bone two and a half inches wide. The edges of the fracture are necrosed. The surrounding bone is porous, and shows traces of the formation of a line of demarcation.

CASE.—Private Charles A. S———, Co. D, 46th New York Volunteers, aged 25 years, was wounded in an engagement near Petersburg, Virginia, June 26th, 1864, by a conoidal musket ball, which entered above the left superciliary ridge, fractured the roof of orbit and the inner table of skull, opened the frontal sinus, and lodged. The eye was bulged out, and the sclerotic coat had the appearance of being blistered; fracture extended ten lines above the supra-orbital arch. He was conveyed to the field hospital of the 3d division, Ninth Corps, where the ball and spiculæ of bone were removed by Surgeon W. C. Shurlock, 51st Pennsylvania Volunteers. He was thence sent to City Point, Virginia, and on July 1st transferred to Washington, D. C., entering Lincoln Hospital on the same day. The wound was looking well for several days, when it became inflamed and swollen, and in order to permit free evacuation of pus it was enlarged. The case progressed favorably until the 14th, when he became very wild and restless, with some fever. Saline cathartics and small doses of calomel were administered, also ipecac and opium. Collodion was applied to brain substance, which protruded like a cauliflower excresence. Coma supervened, and death ensued on July 27th, 1864. The *post-mortem* examination revealed a large amount of subarachnoid effusion; the brain substance in the region of the wound was very soft and pulpy; the left lobe of the cerebellum was softened, and on its external surface was a deposit resembling pus. A similar deposit was also observed in the medulla and upper portion of the spinal cord. The pathological specimen is No. 2891, Sect. I, A. M. M. One inch of the supra-orbital arch is carried away, and the opening involves one square inch of the external table. The opening internally is a little larger, part of the orbital plate is absent, the frontal sinus is opened, and a fissure extends inward to the cribriform plate of the ethmoid. The bone immediately around the opening is cribriform, and is covered with a thin chalky layer of new formation. The specimen was contributed by Acting Assistant Surgeon H. M. Dean.

CASE.—Private *David L. T———*, Co. G, 12th Georgia Regiment, aged 20 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal ball, which entered three-fourths of an inch outside of the outer canthus of the left eye, passed through the zygomatic arch, grooved the squamous portion of the temporal bone for a distance of two inches, involving both tables, and partly imbedded itself in the brain. He remained in a field hospital until June 8th, when he was transferred to the Lincoln Hospital, Washington. He was able to answer questions by "yes" and "no," but not understandingly. The pupils were moderately dilated; the pulse 78 and weak. On the following day he was etherized, and the ball and some fragments of the bone were removed through an incision in the scalp. The wound was full of pieces of fractured bone, and exhibited a disposition to slough. The incision was united by two stitches, and cold water dressings and a bandage were applied. For an hour subsequent to the operation the patient was very wild, requiring to be held in bed. He gradually became quiet, and slept during the night. On the 12th, he answered some interrogatories correctly; his appetite was good,

and his bowels open. He continued in this condition, eating and sleeping well and answering questions, until the 20th, when the coma deepened, and death finally took place on June 23d, 1864. A *post-mortem* examination revealed the left hemisphere entirely broken down, and the cerebellum very much softened. The pathological specimen is No. 2665, Sect. I, A. M. M., and was contributed, with the history, by Acting Assistant Surgeon H. M. Dean.

Case.—Private Edward S———, Co. L, 11th Vermont Volunteers, aged 18 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal ball, which fractured the occipital bone, just above the left extremity of the superior curved line. He was conveyed to Washington, and on the 10th, admitted into Emory Hospital. On the 11th, Surgeon N. R. Moseley, U. S. V., extracted the ball from the left lateral sinus, removed spiculæ of bone, and elevated the depressed portions. Well marked symptoms of compression of the brain existed, with great mental derangement, and the patient was comatose most of the time. Sponges were introduced into the wound to control hæmorrhage, and cold water dressings were applied. A temporary improvement took place, but death ensued on June 18th, 1864. The pathological specimens are shown in the wood-cuts. The opening in the occipital bone, from which fragments have been removed, measures one and a half inches horizontally and one inch in width; the posterior part of the edge shows marks of having been cut away by the bone gouge forceps. There is no fissuring. The surrounding portions of the inner table show marks of diseased action. The specimen was contributed by Surgeon N. R. Moseley, U. S. V.

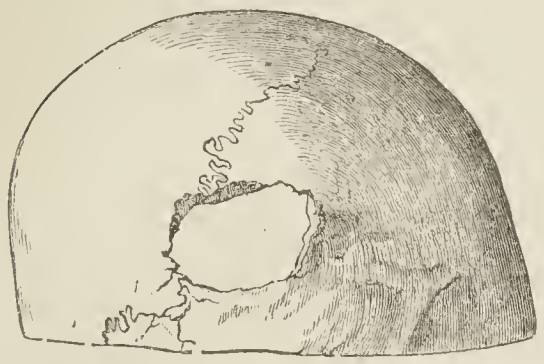

Fig. 120.—Section of cranium fractured by musket ball. *Spec.* 2565, Sect. I, A. M. M.

Fig. 121.—Split ball and fragments of cranium. *Spec.* 4964, Sect. I, A.M. M. [Nat. size.]

Case.—Private John S———, Co. D, 170th New York Volunteers, aged 52 years, was wounded at the battle of North Anna River, Virginia, May 24th, 1864, by a conoidal musket ball, which caused a depressed fracture of the parietal bone. He was admitted into field hospital, 2d division, Second Corps, and thence sent to the Emory Hospital, Washington, May 29th. His mind being weak and wandering, Surgeon N. R. Moseley, U. S. V., elevated and removed a portion of depressed bone. Cold water dressings and light compression were applied to the wound. The patient died on June 8th, 1864. The pathological specimen is No. 4726, Sect. I, A. M. M., consisting of eight small fragments of bone, principally from the inner table, the largest being about one-half inch in width and three-fourths of an inch in length, contributed by Surgeon N. R. Moseley, U. S. V.

Case.—Private Benjamin N———, Co. G, 19th Massachusetts Volunteers, aged 35 years, was wounded at Deep Bottom, Virginia, August 14th, 1864, by a conoidal musket ball, which passed through the zygoma and squamous portion of the left temporal bone and penetrated the brain. He was admitted into the hospital of the Second Corps at City Point on the 16th, being delirious at the time. On the following day, he was forwarded by hospital steamer to Washington, and admitted to the Emory Hospital in a comatose condition. His right side was paralyzed, pulse feeble and 105 per minute, and extensive ecchymosis existed around each eye. There was considerable laceration of the soft parts and extensive comminution of bone. The brain protruded and discharged from the opening. Chloroform was administered, and Surgeon N. R. Moseley, U. S. V., removed the ball and several spiculæ of bone, which had been forced into the brain. Cold water dressings were applied, and the patient was placed on the injured side to promote discharge. Calomel and strict antiphlogistic treatment were ordered, but death supervened on August 19th, 1864. An autopsy showed extensive laceration of anterior and middle lobes of brain. The ball had passed through a portion of pons varolii and the crura cerebelli of left side. The brain was considerably congested. The pathological specimen, represented by the wood-cut, shows a fragment of the squamous portion of the left temporal, with a conoidal ball half severed by the edge of the fractured bone. The fragments include one square inch of surface. The specimen was contributed by the operator, Surgeon N.R. Moseley, U.S.V.

Fig. 122.—Ball and fragments of bone removed from the skull. *Spec.* 3130, Sect. I, A. M. M.

Case.—Private William A. H———, Co. E, 19th Indiana Volunteers, aged 21 years, was wounded at the battle of Antietam, Maryland, September 17th, 1862, by a conoidal ball, which fractured and depressed both tables of the anterior inferior portion of the right parietal bone. The missile had split upon the fractured edge of the bone. He was conveyed to Washington, and admitted to the Capitol Hospital on the 23d, and was thence transferred to the Satterlee Hospital, Philadelphia, October 12th. Three days later, Assistant Surgeon E. de W. Breneman, U. S. A., made a semi-lunar incision in the scalp, and dissected up the flap, when a copious hæmorrhage occurred. He then removed several small detached pieces of bone, and also a triangular piece of the internal table, which was pressing heavily upon the dura mater, and by means of an elevator, raised an adjacent portion of the bone. The membranes of the brain were found to be penetrated, and from the character of the discharge, it was believed that the brain itself was seriously injured. The pulsations of the middle meningeal artery were distinctly felt. After the operation the symptoms of compression passed away. The patient was much prostrated, but in the full possession of his senses. He was kept in bed, on low diet, and under antiphlogistic treatment. On October 23d he was attacked with colliquative

diarrhœa. Pyæmia supervened, causing death on the 21st of November, 1862. The pathological specimen, No. 883, Sect. I, A. M. M., shows five small fragments, from both tables of the parietal bone, representing nearly one square inch of surface. The specimen and history were contributed by Assistant Surgeon E. de W. Breneman, U. S. A.

Case.—Corporal John B———, Co. D, 103d Pennsylvania Volunteers, aged 49 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball, which fractured and depressed the left parietal bone, at a point one inch posterior to the articulation with the temporal bone, and on a line with the temporal ridge. The missile lodged. He was admitted into the Emory Hospital, Washington, on the 7th; being unconscious at the time. On removing spiculæ of the bone, and coagula, considerable hæmorrhage occurred, and cerebral matter exuded. Consciousness returned, but the patient was extremely weak and exhausted from loss of blood. Stimulants were freely given, and cold water dressings applied to the head. On June 8th the wound was again examined, and four spiculæ of bone were removed by Surgeon N. R. Moseley, U. S. V.; the ball could not be discovered. No marked improvement took place at any time. A low, muttering delirium supervened, and death occurred on June 12th, 1864. At the autopsy, a fracture was found extending from the point of entrance to the anterior border of the left parietal bone. A part of the petrous portion of the temporal bone was carried away. Extensive inflammation existed throughout the left hemisphere. The pathological specimen, No. 2506, Sect. I, A. M. M., was contributed by Surgeon N. R. Moseley, U. S. V., and consists of three fragments of bone of the cranium, involving a little over one square inch of the inner table.

Case.—Private Benjamin H. C———, Co. G, 48th Illinois Volunteers, was wounded in an engagement near Atlanta, Georgia, July 21st, 1864, by a conoidal ball, which fractured both tables of the cranium, at the middle of the superior border of the left parietal bone. He was immediately conveyed to the hospital of the 4th division, Fifteenth Corps, where he remained until August 11th, when he was transferred to Marietta, Georgia, and admitted into general field hospital, Fifteenth Corps. Several fragments of bone were removed, cold water dressings applied to the head, and nourishing diet ordered. The case progressed favorably until the 20th, when patient began to fail. Convulsions occurred, coma supervened, and death ensued on August 23d, 1864. The pathological specimen is No. 3486, Sect. I, A. M. M., a segment of cranium necrosed at the seat of injury. The diseased surface of the outer table measures two by two and a half inches, and there is an opening three-fourths of an inch in diameter. Other fragments, almost separated, are in situ, and the rest of the bone is discolored, cribriform, and carious. Internally the diseased surface measures one-fourth by two and a half inches. The specimen was contributed by Surgeon A. Goslin, 48th Illinois Volunteers.

Case.—Sergeant James F———, Co. K, 14th Maine Volunteers, aged 34 years, was wounded at Port Hudson, Louisiana, May 27th, 1863, by a conoidal musket ball, which caused a compound comminuted fracture of the right parietal bone, one inch anterior to the parietal eminence. He was conveyed to New Orleans, and entered the University Hospital on the 29th. A number of small pieces of bone were removed from the anterior portion of the parietal bone. The case pogressed well until June 5th, when the patient became comatose and died. A continued discharge of brain substance had taken place for fourteen hours before his death. The pathological specimens are No. 1301 and 1302, showing, the former, a section of the cranium; and the latter, a wet preparation of a segment of the scalp. The fracture in the cranium measures one and three-fourths inches antero-posteriorly, and nearly one inch in width. A fragment of the inner table remains attached, being depressed two lines on the free edge. A fissure of both tables passes into the temporal bone, entering the auditory canal. The specimens and history were contributed by Assistant Surgeon P. S. Connor, U. S. A.

Case.—Sergeant Lewis N. E———, Co. I, 1st Michigan Volunteers, aged 28 years, was wounded March 29th, 1865, at the South Side Railroad, Virginia, by a conoidal ball, which entered at the posterior superior angle of the parietal bone. He was at once admitted to the hospital of the 1st division, Fifth Corps, and thence sent to the Emory Hospital, Washington, where he arrived on April 4th in a comatose condition, with partial paralysis of the lower extremities. He was on the same day placed under the influence of chloroform and ether, and Surgeon N. R. Moseley, U. S. V., removed nine spiculæ of bone, together with a portion of the ball. Water dressings were applied, tonics, stimulants, and nutritious diet ordered, but death ensued on April 23d, 1865, from exhaustion. The pathological specimen is No. 4075, Sect. I, A. M. M., part of a conoidal ball and six fragments of outer and inner table and diploë, making up together nearly one square inch of bone. The specimen and history were contributed by Surgeon N. R. Moseley, U. S. V.

Case.—Private Augustus E———, Co. D, 20th Maine Volunteers, aged 20 years, was wounded at the battle of Spottsylvania, Virginia, May 12th, 1864, by a fragment of shell, which fractured the anterior superior angle of the right parietal bone. He was admitted into Stanton Hospital, Washington, on the 20th, where spiculæ of bone were removed. Ice dressings were applied, and tonics and stimulants administered. The patient sank rapidly, and died on May 24th, 1864, from exhaustion. The pathological specimen is No. 2679, Sect. I, A. M. M. A section of cranium, with six fragments of bone. The opening in the parietal measures one and three-fourth inches from right to left, and half an inch antero-posteriorly. The shape of the opening is very unusual, being nearly that of a rectangle. The specimen and history were contributed by Assistant Surgeon George A. Mursick, U. S. V.

Case.—Private John W. A———, Co. F, 70th Indiana Volunteers, was wounded at the battle of Resaca, Georgia, May 14th, 1864, by a conoidal ball, which entered at the outer and upper angle of the right orbit. He was for several weeks treated in the hospital of the 3d division, Twentieth Corps, near Resaca, where fragments of bone were removed. On June 25th, he was conveyed to the field hospital at Chattanooga, Tennessee. The patient was insensible at the time of admission, and died within half an hour. At the autopsy, the opening made by the missile was found to be nearly an inch in diameter, the fracture involving the superciliary ridge, the orbital plate, the external angular process, and frontal sinus. The pathological specimen is No. 1235, Sect. I, A. M. M. One fragment of the orbital plate remains in situ, slightly depressed. The inner table opposite each frontal eminence is cribriform. The specimen was contributed by Acting Assistant Surgeon H. S. Kilburn.

Case.—Private Asher P———, Co. G, 14th New Jersey Volunteers, aged 32 years, was wounded at the battle of Cold Harbor, Virginia, June 1, 1864, by a conoidal ball, which entered at the centre of the supra-orbital ridge, left side of the *os frontis*, producing a comminuted fracture, which extended transversely to the coronal suture, and below to the junction of the zygoma with the malar bone. The missile lodged in the brain. He was immediately admitted to the 3d division, Sixth Corps, hospital, and on June 10th transferred to the Lincoln Hospital, Washington. No untoward symptoms appeared until the 18th, when he complained of pain in his head. Several spiculæ of bone, and a buckshot much put out of shape, were extracted. On the 20th, he was placed under the influence of ether. A crucial incision was then made in the scalp, and several portions of the supra-orbital plate, and of the inner table of the frontal bone, were removed; also a conoidal ball, which was deeply imbedded in the brain substance. After the operation, the patient improved until the 24th, when delirium set in. Total unconsciousness, restlessness, and low muttering supervened, succeeded by partial and then entire paralysis of the body. These symptoms prevailed until June 24th, 1864, when death ensued. The *post-mortem* examination revealed the brain at the seat of injury very much disorganized, of a dark brown color, and of the consistency of starch. The rest of the brain was much softened, the ventricles containing a large quantity of fluid. The pathological specimen is No. 2666, Sect. I, A. M. M., and was contributed by Acting Assistant Surgeon A. Ansell.

Case.—Private Charles S. Mattox, Co. H, 12th Pennsylvania Reserves, aged 20 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 10th, 1864, by a conoidal ball, which fractured and depressed the left parietal bone. He was brought to the Emory Hospital, Washington, on the 13th, in an almost senseless condition. On the 18th, Surgeon N. R. Moseley, U. S. V., removed the depressed bone and applied cold water dressings. The patient revived and continued to improve until the 21st, when he suddenly relapsed into a comatose condition, and died on the following day. The history was contributed by Surgeon N. R. Moseley, U. S. V.

Case.—Sergeant George Saunders, Co. D, 7th New York Heavy Artillery, aged 39 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal ball, which entered the back of the head a little above the occipital protuberance, and to the right of the median line, comminuted the bone at the orifice of entrance and lodged in the cranium. He was conveyed to Washington, entering Emory Hospital on June 7th, whence he was transferred to Baltimore on the 11th, and admitted to Camden Street Hospital. On June 16th, he was placed under the influence of chloroform, and Surgeon Z. E. Bliss, U. S. V., removed a number of loose fragments of bone, and with a probe traced the track of the ball through the substance of the brain, in a forward and upward direction about four inches, but failed to discover the ball. Some pus escaped as the probe was introduced. The parts were very little swollen and not very painful. The patient reacted promptly. Interrupted sutures were inserted, adhesive strips and cold water dressings applied, opiates administered, and stimulants and nutritious diet ordered. There was no apparent change in the patient's condition after the operation. Coma supervened, and death occurred June 18th, 1864.

Case—Adjutant Henry McConville, 25th Massachusetts Volunteers, aged 25 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball, which entered the right parietal eminence, causing extensive comminution, and lodged in the substance of the brain. He received, in the same engagement, two other wounds; one in the neck and the other in the chest. On June 3d, he was admitted to the Eighteenth Corps hospital, and thence transferred, on June 6th, to the Armory Square Hospital, Washington. Simple dressings were applied to the head. On June 11th, several spiculæ were removed from the fractured cranium. Coma supervened and the case terminated fatally on June 12th, 1864.

Besides the cases of removal of fragments of the skull after gunshot fracture some details of which have been given in the foregoing abstracts, one hundred and five cases of a similar nature are entered upon the registers. Many of them present features of interest; but the space allotted to this Section will not admit a full record of their histories. It is only practicable to enumerate them, and to note the more prominent complications.

Hæmorrhage.—Bleeding, either intracranial or from vessels without the skull, is mentioned by the reporters as an important element in seven of these cases.

Aberneathy, J. W., Sergeant, Co. B, 15th South Carolina Regiment, aged 26 years. Fredericksburg, December 13th, 1862. Fracture of right parietal by conoidal ball. Charlottesville Hospital. Removal of ball and fragments. Arterial hæmorrhages occurred December 16th and 19th. Died December 19th, 1862.

Dane, William, Private, 21st, Massachusetts, aged 16 years. South Mills, April 18th, 1862. Fracture of frontal by conoidal ball. Hygeia Hospital. May 4th, removal of ball and fragments of bone. Hæmorrhage giving rise to clot within the cranium. May 5th, clotted mass was removed. Died May 7th, 1862.

Delano, Everett M., Private, Co. E, 1st Maine Heavy Artillery, aged 21 years. Spottsylvania, May 12th, 1864. Fracture of left temporal by conoidal ball. Emory Hospital, Washington. Removal of ball and fragments of bone, May 22d. Hæmorrhage from jugular vein took place, causing death within two minutes, May 22d, 1864.

Dougherty, Joseph, Sergeant, Co. B, 69th New York, aged 23 years. Spottsylvania, May 13th, 1864. Fracture of right parietal by shell. Alexandria hospital. Removal of fragment of bone. Hæmorrhage from middle meningeal artery. Ligation of common carotid above the omo-hyoid. May 26th, hæmorrhage recurred. Died May 26th, 1864.

Konkle, W. H., Private, Co. B, 44th Georgia Regiment. Cold Harbor, June 2d, 1864. Fracture of frontal by shell. Chimborazo Hospital, Richmond. Removal of fragments of bone. Hæmorrhage. Death, June 8th, 1864.

Neal, Joseph, Private, Co. B, 1st Maryland. Chancellorsville, May 3d, 1863. Fracture of right parietal by canister-shot. St. Aloysius Hospital, Washington. May 10th, removal of spiculæ. June 8th, hæmorrhage from a branch of the temporal artery. Died June 16th, 1863.

Taylor, Rodney I., Private, Co. F, 1st Maine Heavy Artillery, aged 25 years. Spottsylvania, May 19th, 1864. Fracture of left temporal by conoidal ball. Armory Square Hospital, Washington. Removal of spiculæ, and ligation of temporal artery, June 3d. Death, June 5th, 1864.

In four instances, the bleeding was from vessels within the skull; in two, from the temporal artery or its branches; in one, from the jugular vein. In two of the cases of intracranial bleeding, solutions of persulphate of iron on dossils of lint were employed. In the case of rupture of the middle meningeal artery, Surgeon E. Bentley, U. S. V., resorted to the extreme measure of ligating the common carotid artery. The hæmorrhage did not recur; but the patient succumbed on the thirteenth day, after a series of chills and other phenomena of pyæmic infection. In the case of Aberneathy,[1] paraplegic, treated by Dr. J. S. Davis, of the University of Virginia, the temperature was observed, and found lowered on the side opposite the injury. In three of the seven cases, balls, as well as bone splinters, were removed. Surgeon N. R. Moseley, U. S. V., ascribed the almost instantaneous death, in the patient with hæmorrhage from the jugular vein, to the entrance of air into the vessel, which was found largely opened by ulceration.

Gangrene.—Among the cases of this category were three of sloughing of the wound of the scalp:

Caley, John, Sergeant, Co. A, 11th Tennessee Cavalry, aged 51 years. Nashville, October 27th, 1864. Penetrating fracture of parietal by pistol ball, during an affray. Cumberland hospital. Removal of fragments. November 5th, gangrene appeared. Death, November 7th, 1864.

Shannon, James F., Captain, Co. C, 9th Pennsylvania Reserves, aged 33 years. Bull Run, August 29th, 1862. Gunshot fracture of left parietal. Hospital at Georgetown, D. C. September 7th, removal of fragments of bone; September 10th, gangrene; September 12th, death.

Starr, James A., Corporal, Co. B, 18th Indiana. Gunshot fracture of the left parietal. Admitted to Hospital No. 6, New Albany, Indiana, October 7th, 1863. Removal of fragment of bone. December 20th, gangrene attacked the wound. Death, December 26th, 1863.

Pyæmia.—This complication is not often referred to in the notes of the cases of this class, though doubtless often existing unremarked. The all-pervading malarial element to which our sick and wounded were continuously exposed, while modifying the symptoms of many diseases, served yet more remarkably to mask the phenomena resulting from traumatic affections. And this was especially true in regard to pyæmia. The most skilled observers were frequently at a loss, whether to regard a chill occurring in a wounded man, as the result of the malaria of the locality, or the premonition of pus formation. In a great number of cases time or opportunity for autopsy were lacking.

Bristol, L. T., Corporal, Co. G, 37th Wisconsin, aged 25 years. Petersburg, July 30th, 1864. Fracture and depression of occipital by conoidal ball. Field and New York hospitals. Removal of fragments of bone. August 11th, pyæmia developed. Died August 14th, 1864.

Chrisholm, Neal K., Private, Co. H, 17th Alabama Regiment, aged 38 years. Atlanta, July 20th, 1864. Fracture of frontal by conoidal ball. Nashville hospitals. Removal of fragments of bone, September 5th. October 6th, pyæmia supervened, resulting in death, October 12th, 1864.

Abscess.—Formations of pus between the skull and membranes, and within the brain tissue, were not uncommon.

Archel, Moses, Private, 22d U. S. Colored Troops, aged 28 years. Petersburg, June 15th, 1864. Fracture of frontal by conoidal ball. Field and Balfour hospitals. Removal of fragments at various times. Died August 11th, 1864, from pressure on brain produced by pus accumulated beneath the skull.

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[1] For a full account of this case, see *Confederate States Medical and Surgical Journal.* Vol. I, page 42. March, 1864.

HAYDON, MICHAEL, Private, Co. D, 6th Wisconsin. Gettysburg, July 1st, 1863. Fracture of left side of frontal bone by conoidal ball. Camp Letterman and York hospitals. Removal of fragments. Epileptic convulsions July 25th. Death, August 5th, 1863. Autopsy revealed a large abscess under pia mater.

PARKER, LOUIS, Private, Co. K, 43d New York, aged 32 years. Fredericksburg, December 13th, 1862. Fracture of occipital by conoidal ball. Third division hospital, Alexandria. Removal of several fragments. Died January 13th, 1863. Autopsy revealed two ounces of grayish pus between dura mater and cerebellum.

P———, DOMINICK, Private, Co. K, 10th New York. Fredericksburg, December 13th, 1862. Depressed fracture of occipital by conoidal ball. Field and Georgetown hospitals. Several fragments of bone removed. Death, December 13th, 1862. Autopsy revealed subarachnoid effusion of blood and softening of posterior lobe of brain. Viscera inflamed. The pathological specimen is No. 865, Sect. I, A. M. M., a segment of cranium, with depression of fragments. Contributed by Brigade Surgeon John L. Le Conte, U. S. V.

TURNEY, RICHARD L., Private, Co. E, 2d Pennsylvania, aged 23 years. Petersburg, August 3d, 1864. Fracture and depression of right parietal by shell. Field and Fort Monroe hospitals. Removal of pieces of depressed bone August 9th, Died August 10th, 1864, from compression of the brain by pus beneath the dura mater.

DUNHAM, GEORGE W., Private, Co. E, 9th New York Heavy Artillery. Cold Harbor, June 1st, 1864. Penetrating fracture of left parietal by conoidal ball. Corps and Fairfax Seminary hospitals. Removal of fragments. Died June 11th, 1864, from abscess formed in the brain.

UNKNOWN. Gunshot fracture of left temporal. Lincoln Hospital, Washington, April 8th, 1865. Removal of fragments April 10th. Died April 12th, 1865. Autopsy showed a large abscess involving nearly the entire left side of cerebrum.

Worley, William, Private, Danville Artillery, aged 22 years. Petersburg, April 1st, 1865. Penetrating fracture of parietal by conoidal ball. Lincoln Hospital, Washington. Removal of fragments April 18th. Death, April 23d, 1865. Autopsy revealed an abscess in upper portion of brain.

Encephalitis.—Of course nearly all of the fatal cases might come under this heading, but a few, undistinguished by special complications, are placed here:

QUINE, JOHN, Private, Co. G, 12th Illinois. Allatoona, Georgia, October 5th, 1864. Fracture of frontal, left side, by conoidal ball. Left eye destroyed. Corps hospital. Removal of fragments and some brain substance. Meningitis. Died October 13th, 1864.

SMITH, JOHN E., Private, Co. D, 16th Indiana. Arkansas Post, January 11th, 1863. Fracture of left parietal by grape-shot. Dura mater not injured. Adams Hospital, Memphis. Removal of depressed bone. Inflammation of meninges. Died February 8th, 1863.

HOWETH, JOHN, Lieutenant, Co. C, 6th New Jersey. Chancellorsville, May 3d, 1863. Fracture of frontal by conoidal ball. Removal of ball and fragments. Aloysius Hospital, Washington, May 13th. Traumatic encephalitis. Died May 14th, 1863.

LOUDERBECK, GEORGE, Private, Co. B, 4th Ohio, aged 27 years. Ream's Station, August 25th, 1864. Depressed fracture of frontal bone by conoidal ball. Corps and Emory hospitals. Elevation and removal of spiculæ August 31st. Died September 3d, 1864, of phrenitis.

Taylor, J., Private, Co. C., 5th North Carolina Regiment, aged 23 years. Winchester, September 19th, 1864. Fracture of cranium by conoidal ball. Depot hospital at Winchester. Removal of fragments. Died September 21st, 1864, from cerebritis.

THOMPSON, WILLIAM, Private, Co. E, 10th Massachusetts, aged 41 years. Spottsylvania, May 12th, 1864. Fracture of frontal by conoidal ball. Corps and Emory hospitals. Removal of ball and fragment of bone May 18th. Inflammation of brain. Died May 30th, 1864.

The two following cases illustrate the danger of cerebral inflammation at periods remote from the reception of the injury:

YOUNG, GEORGE J., Corporal, Co. D, 29th Ohio, aged 20 years. Pine Knob, Georgia, June 15th, 1864. Fracture of frontal by conoidal ball. Field, Nashville, and Columbus hospitals. Removal of fragment of bone. Inflammation of brain. Died June 13th, 1865.

B———, HUGH, Corporal, Co. I, 2d U. S. Infantry, aged 33 years. Gettysburg, July 2, 1863. Fracture of frontal and zygomatic process of malar bone by conoidal ball. Left eye destroyed. Gettysburg and York hospitals. Removal of several fragments. Died February 6th, 1864, from inflammation of brain, the result of a debauch.

Missiles lodged—The nine following cases present examples of the lodgement of projectiles in the brain tissue:

ATCHINSON, NATHAN, Private, Co. F, 7th Illinois. Allatoona, October 5th, 1864. Penetrating fracture of frontal, left side, by conoidal ball; missile lodged. Field hospital. Removal of fragments; loss of brain substance. Died October 10th, 1864.

CAULHE, E. T., Private, Co. I, 3d New Hampshire. Fort Darling, May 15th, 1864. Fracture of sphenoid and petrous portion of left temporal bone by conoidal ball. Field and Point Lookout hospitals. Removal of fragments. Died May 22d, 1864. At the autopsy, a portion of the missile was found driven deeply into the brain matter.

CLARK, HENRY, Private, Co. B, 1st New Jersey, aged 23 years. Petersburg, March 31st, 1865. Fracture of right parietal by conoidal musket ball. Field and Washington hospitals. Removal of fragments. Died April 13th, 1865. The autopsy revealed the ball in the middle lobe of the brain.

GEORGE, JOHN, Corporal, Co. I, 51st Pennsylvania, aged 26 years. Petersburg, July 30th, 1864. Penetrating fracture of frontal by conoidal ball. Treated in field hospital. Fragments of bone removed; missile remained in the wound. Died August 8th, 1864.

JOURDON, W., Co. F, 1st United States Sharpshooters. Chickahominy, June 28th, 1862. Fracture of right parietal by conoidal musket ball. The greater part of the missile passed into the brain substance. Field and Annapolis hospitals. Removal of fragments. Died August 12th, 1862.

KRIEGER, FRANCIS, Private, Co. H, 110th Ohio Volunteers, aged 20 years. Monocacy, July 9th, 1864. Penetrating fracture of left parietal; missile lodged in the substance of the brain. Frederick hospital. Removal of several depressed fragments of bone. Died July 12th, 1864.

UNKNOWN, admitted to Lincoln Hospital, Washington, April 8th, 1865. Gunshot penetrating wound of left parietal; missile lodged in the brain substance. Removal of depressed fragments of bone April 9th. Died April 10th, 1865.

WILLIAMS, CHARLES P., Lieutenant, Co. F, 24th New York Cavalry. Sailor's Creek, Virginia, April 6th, 1865. Penetrating fracture of cranium; missile lodged in the brain substance. Field hospital. Removal of portion of bone. Death, April 10th, 1865.

HENRY, CHARLES, Private, Co. F, 26th Pennsylvania, aged 38 years. Mine Run, November 27th, 1863. Gunshot fracture of frontal by conoidal ball. Field and Alexandria hospitals. Removal of ball and fragments December 4th. Died December 6th, 1863.

Next is a misplaced case of intracranial extravasation:

HAWKINS, WILLIAM C., Private, Co. C, 11th Vermont, aged 18 years. Petersburg, June 24th, 1864. Gunshot wound of the occipital bone. Field and New York hospitals. Removal of portion of bone. Died July 14th, 1864, from cerebral apoplexy.[1]

Deaths from Intercurrent Diseases.—Three have been so classified:

BURKE, ANDREW, Private, Co. E, 47th Pennsylvania, aged 23 years. Cedar Creek, October 19th, 1864. Fracture of orbital bones, and lower third of right humerus, by conoidal balls. Field, Winchester, and Frederick hospitals. Removal of bone from cranium, December 13th, 1864. Died December 23d, 1864, from phthisis pulmonalis.

DEWEL, ASA, Private, Co. H, 109th New York, aged 27 years. Petersburg, July 9th, 1864. Depressed fracture of parietal by conoidal ball. Corps and New York hospitals. Removal of fragments of bone. Died August 10th, 1864, from chronic diarrhœa.

W———, William M., Private, Co. I, 19th Georgia regiment. Fredericksburg, December 13th, 1862. Fracture of frontal and right parietal bones by a buckshot. Washington hospitals. Removal of fragments. Died March 1st, 1863, of pneumonia. The pathological specimen is No. 991, Sect. I, A. M. M. Probably a case of metastic foci.

In many cases, the proximate cause of death was not distinctly stated:

ARNOLD, EDWIN, Private, Co. F, 2d Michigan, Petersburg, June 28th, 1864. Fracture of cranium by conoidal ball. Corps hospital. Removal of spiculæ. Died June 29th, 1864.

BREMER, LUDWIG, Private, Co. C, 45th Pennsylvania, aged 45 years. Petersburg, April 2d, 1865. Fracture of right parietal by conoidal ball. Corps and Washington hospitals. Removal of fragments of depressed bone, April 8th. Death, April 12th, 1865.

BURNS, JOHN, Private, Co. A, 45th New York. Gettysburg, July 2d, 1863. Fracture of cranium by conoidal ball. Regimental hospital. Removal of bone. Death, July 13th, 1863.

BOLSTER GEORGE, Private, Co. G, 2d New York Cavalry. Five Forks, April 1st, 1865. Fracture of cranium by piece of shell. Regimental and corps hospitals. Removal of fragments, April 3d. Death, April 17th, 1865.

Bradford, P. C., Private, Co I, 10th Texas. Atlanta, July 20th, 1864. Penetrating fracture of cranium by conoidal ball. Confederate and corps hospitals. Removal of bone. Death, December 28th, 1864.

BOEN, NICHOLAS, Private, Co. G, 110th New York. Vermillionville, November 12th, 1863. Fracture of right parietal by fragment of shell. Corps hospital. Elevation and removal of bone. Death, December 12th, 1863.

BROWN, HERMAN, Private, Co. C, 5th Wisconsin, aged 32 years. Fort Steadman, April 2d, 1865. Fracture of left parietal, posterior portion of temporal, and inferior portion of occipital, by a conoidal ball. Corps and Alexandria hospitals. Removal of portions of left parietal. Death, April 8th, 1865.

[1] This case should have followed that of Reed, on page 247.

BLANFORD, JOSIAH, Private, Co. D, 24th New York Cavalry. Petersburg, July 1st, 1864. Fracture of parietal by musket ball. Field hospital. Removal of fragments. Death, July 3d, 1864.

CALL, JOHN H., Private, Co F, 14th New York. Petersburg, July 30th, 1864. Fracture of occipital by solid shot. Corps, City Point, and New York hospitals. Removal of spiculæ, August 29th. Death, November 19th, 1864.

CLARK, SOLOMON, Private, Co. H, 25th Iowa. Dallas, May 28th, 1864. Perforating fracture of cranium by conoidal ball. Corps hospital. Removal of spiculæ. Death, June 1st, 1864.

Colored Cook of the 109th New York. Petersburg, July 10th, 1864. Fracture of the parietal, and penetration of the cerebrum by a gunshot missile. Corps hospital. Removal of fragments of bone. Death, July 10th, 1864.

DUNBAR, SAMUEL, Private, Co. H, 102d Pennsylvania, aged 36 years. Cedar Creek, October 19th, 1864. Fracture of the left parietal by conoidal ball. Philadelphia and Baltimore hospitals. Removal of spiculæ of bone one-half and three-fourths of inch. Paralysis. Died after discharge, February 22d, 1866.

Duke, J., Private, Co. K, 9th Georgia. Darbytown, August 16th, 1864. Fracture of the right temporal and the fronta by conoidal ball. Richmond hospitals. Removal of spiculæ of bone. Death, August 22d, 1864.

Donway, S., Private, Co. A., Palmetto Sharpshooters. Fort Harrison, September 29th, 1864. Extensive fracture of the frontal by conoidal ball. Richmond hospital. Removal of spiculæ of bone October 2d. Death, October 6th, 1864.

EWELL, WILLIAM D., Sergeant, Co. C, 38th Massachusetts, aged 38 years. Cedar Creek, October 19th, 1864. Compound comminuted fracture of cranium by conoidal ball. Corps hospital. Removal of depressed bone. Death, November 2d, 1864.

EGGERT, SOLOMON F., Private, Co. I, 2d New York Rifles. Petersburg, June 20th, 1864. Gunshot fracture of cranium. Corps hospital. Removal of spiculæ of bone. Death, July 1st, 1864.

EDDY, HENRY M., Captain, Co. D, 114th Pennsylvania. Five Forks, April 2d, 1865. Fracture of occipital. Regimental and City Point hospitals. Removal of loose pieces of bone on day of injury. Death, April 11th, 1865.

FOSTER, JAMES F., Private, Co. D., 100th Pennsylvania. Petersburg, October 2d, 1864. Fracture of right parietal by a musket ball. Corps hospital. Removal of spiculæ and elevation of the depressed parts October 2d. Death, October 4th, 1864.

FARRELL, JOHN W., Private, Co. E, 87th Indiana, aged 23 years. Chickamauga, September 20th, 1863. Fracture of left parietal by conoidal ball. Chattanooga hospital. Removal of loose pieces of bone October 1st. Death, October 12th, 1863.

GALBRAITH, HUGH, Corporal, Co. G, 56th New York, aged 23 years. Honey Hill, November 30th, 1864. Fracture of left parietal by conoidal ball. Hilton Head hospital. Removal of fragments of bone December 1st. Death, December 1st, 1864.

HORAN, MICHAEL, Private, Co. H, 16th Michigan, aged 39 years. Petersburg, June 16th, 1864. Fracture of left parietal by conoidal ball. Field and Washington hospitals. Removal of loose bone fragments and elevation of bone July 2d. Death, July 7th, 1864.

HALL, MYRON, Private, Co. K, 8th Illinois Cavalry. Muddy Run, Virginia, November 8th, 1863. Fracture of the cranium by conoidal ball. Corps hospital. Removal of fragments of bone. Death, November 10th, 1863.

HANNOWDELL, W. H., Private, Co. E, 2d Pennsylvania Heavy Artillery. Petersburg, August 19th, 1864. Fracture of the frontal, left side, by conoidal ball. Corps and Alexandria hospitals. Removal of spiculæ. Death, August 30th, 1864.

HOWARD, O., Private, Co. F, 36th Massachusetts. Jackson, July 22d, 1863. Fracture of the cranium at the junction of parietal and occipital by conoidal ball. Corps, regimental, and Cincinnati hospitals. Removal of one square inch of skull July 22d. Death, September 22d, 1863.

HUNT, PAUL S., Private, Co. D, 57th Indiana. Dallas, May 27th, 1864. Gunshot fracture of the left parietal. Corps hospital. Removal of a piece of bone May 27th. Death, June 4th, 1864.

KELLER, CONRAD, Private, Co. M, 6th New York Cavalry. Trevillian Station, June 11th, 1864. Gunshot fracture of the skull. Corps hospital. Removal of fragments of bone. Died June 14th, 1864.

KNIGHTLINGER, GEORGE W., Private, Co. F, 8th Michigan. Petersburg, July 26th, 1864. Fracture and depression of the cranium by a piece of shell. Corps and field hospitals. Removal of spiculæ and elevation of bone July 26th. Death, December 13th, 1864.

LAND, LEWIS J., Lieutenant, Co. B, 11th Illinois, aged 28 years. Fort McAllister, December 13th, 1864. Fracture of the left parietal by conoidal ball. Corps and Beaufort hospitals. Removal of spiculæ from the brain December 27th. Death, January 4th, 1865.

LOTTZ, PHILIP, Private, Co. H, 55th New York, aged 24 years. Williamsburg, May 5th, 1862. Fracture of the left parietal by musket ball. Baltimore and New York hospitals. Removal of fragments of bone May 19th. Death, May 21st, 1862.

MARTIN, EDWARD, Private, Co. D, 5th Wisconsin. Petersburg, March 25th, 1865. Fracture and penetration of the cranium by a piece of shell. Corps and field hospitals. Removal of several spiculæ from the left parietal bone March 25th. Death, March 27th, 1865.

MCGEE, GEORGE F., Sergeant Major, 2d Michigan. Petersburg, April 2d, 1865. Fracture and depression of cranium by a conoidal ball. Corps hospital. Removal of ball and spiculæ of bone. Death, April 10th, 1865.

McColley, Patrick, Private, Co. F, 6th New Hampshire. North Anna, May 18th, 1864. Fracture of cranium by a conoidal ball. Corps hospital. Removal of pieces of bone. Died May 18th, 1864.

McLaughlin, George, Private, Co. A, 20th Connecticut. Atlanta, August 20th, 1864. Gunshot fracture of squamous portion of left temporal bone. Corps hospital. Removal of fragments of bone. Died August 28th, 1864.

Marston, John, Private, Co. D, 14th New York Heavy Artillery. Fort Steadman, March 25th, 1865. Fracture of cranium by conoidal ball. Corps hospital. Removal of spiculæ of bone March 25th. Died March 27th, 1865.

Myrick, Cromwell, Sergeant, Co. B, 4th Rhode Island. Petersburg, July 15th, 1864. Fracture of cranium by a conoidal ball. Corps hospital. Removal of pieces of bone. Death, July 20th, 1864.

Mills, Fessendon M., Private, Co. C, 17th Maine. Gettysburg, July 2d, 1863. Fracture of cranium and injury of brain by a conoidal ball. Corps hospital. Removal of several spiculæ. Death, July 2d, 1863.

McNealy, James A., Private, Co. A, 20th Maine. Fredericksburg, December 13th, 1862. Gunshot fracture of cranium. Corps hospital. Removal of spiculæ of bone. Death, December 19th, 1862.

Northway, Clement L., Private, Co. A, 22d Wisconsin. Atlanta, July 23d, 1864. Gunshot fracture of frontal and penetration of the dura mater. Corps hospital. Removal of fragments of bone. Died August 1st, 1864.

Pembroke, Charles P., Private, Co D, 7th Maine, aged 20 years. Wilderness, May 6th, 1864. Gunshot fracture of skull. Corps hospital. Removal of depressed bone. Death, May 6th, 1864.

Rand, Irwin W., Sergeant, Co. H, 6th New Hampshire. Petersburg, July 30th, 1864. Gunshot penetrating wound of cranium. Corps hospital. Removal of pieces of both tables. Died August 2d, 1864.

Olinger, Anthony, Private, Co. A, 100th Indiana. Jonesboro', September 1st, 1864. Fracture of right parietal. Corps hospital. Removal of fragments of bone. Died September 21st, 1864.

Q———, J., Confederate. Chancellorsville, May 3d, 1863. Fracture of parietal by conoidal ball. Richmond hospital. Removal of eight pieces of bone May 10th. Paralysis. Death, May 19th, 1863.

Rees, Charles L., Private, Co. K, 95th Pennsylvania, aged 20 years. Spottsylvania, May 12th, 1864. Fracture of both tables of frontal by shell. Corps and Washington hospitals. Removal of fragments of bone. Death, May 26th, 1864.

Robertson, William, Private, Co. D, 7th Michigan. Winchester, September 19th, 1864. Gunshot fracture of the left parietal. Corps hospital. Removal of several spiculæ and elevation of depressed bone. Death, September 23d, 1864.

Russell, Henry, Private, Co. D, 36th Massachusetts. Petersburg, August 8th, 1864. Gunshot fracture of cranium. Corps hospital. Removal of spiculæ of bone. Death, August 10th, 1864.

Rutledge, Charles, Private, Co. B, 2d Illinois Artillery, aged 19 years. Accidentally, March 19th, 1864. Fracture of the right parietal by conoidal ball; fragments of bone removed on the same day. Memphis hospital. Death, March 21st, 1864.

Sachs, Martin, Private, Co. F, 147th Pennsylvania, aged 24 years. December 21st, 1864. Fracture of cranium by shell. Corps hospital. Removal of fragments of bone. Death, December 22d, 1864.

Sheard, Eli, Private, Co. K, 31st Wisconsin. Smithfield, March 19th, 1865. Gunshot fracture of the cranium, with depression. Corps hospital. Removal and elevation of the depressed pieces of bone. Death, March 26th, 1865.

Smith, George, Private, Co. I, 51st New York. North Anna, May 18th, 1864. Fracture of cranium by a conoidal ball. Corps hospital. Removal of spiculæ of bone. Death, May 24th, 1864.

Smith, H. A. F., Private, Co. E, 12th Massachusetts, aged 25 years. Petersburg, June 18th, 1864. Fracture of cranium by a shell. Regimental and corps hospitals. Fractured pieces were elevated and removed. Death, June 25th, 1864.

Spencer, Edwin D., Private, Co. E, 50th Pennsylvania. Spottsylvania, May 9th, 1864. Gunshot fracture, with depression of the left parietal. Corps hospital. Protruding brain tissue and also seven pieces of bone were removed. Paralysis. Death, May 9th, 1864.

Scroggins, Robert, Private, Co. D, 7th Indiana Cavalry. Collierville, Tennessee, April 4th, 1865. Fracture of left parietal by conoidal ball. Adams Hospital, Memphis. Removal of fragments of bone. Died April 14th, 1865.

Snyder, F., Private, Co. E, 110th Ohio, aged 43 years. Monocacy Junction, June 9th, 1864. Fracture of the cranium, with slight depression, by conoidal ball. Frederick hospital. Removal of spiculæ of bone. Died after discharge from service, March 7th, 1866.

Taber, Calvin C., Private, Co. G, 56th North Carolina, aged 23 years. Petersburg, March 27th, 1865. Fracture of both tables of the frontal by conoidal ball. Corps and Washington hospitals. Removal of depressed fragments of bone April 11th. Death, April 16th, 1865.

Thomas, William, Private, Co. G, 12th Indiana. Atlanta, August 14th, 1864. Fracture of the right parietal by conoidal ball. Removal of spiculæ of bone. Death, August 15th, 1864.

Tracey, Aaron, Private, Co. K, 31st Maine. Petersburg, June 17th, 1864. Fracture of the cranium by conoidal ball. Corps hospital. Several pieces of bone were removed. Died June 17th, 1864.

Unknown. Monocacy Junction, July 9th, 1864. Fracture and depression of the cranium. Frederick hospital. Removal of the depressed fragments July 10th. Death, July 12th, 1864.

UPTON, GEORGE E., Lieutenant, Co. F, 6th New Hampshire. Petersburg, July 30th, 1864. Fracture of the cranium by conoidal ball. Corps hospital. Removal of pieces of bone. Death, July 31st, 1864.

VAN DOCKKUM, ALEXANDER, Corporal, Co. A., 19th U. S. Infantry. Shiloh, April 6th, 1863. Fracture of the left parietal. Louisville hospital. Removal of loose pieces of bone, April 18th. Death, April 20th, 1862.

WATSON, JOHN, Private, Co. I, 5th New Hampshire, aged 21 years. Fort Steadman, March 25th, 1865. Fracture of frontal by a conoidal ball. Corps and Washington hospitals. Removal of several small spiculæ of depressed bone and the ball. Death, May 3d, 1865.

WAKEFIELD, WILLIAM W., Private, Co. H, 2d Delaware. Chancellorsville, May 3d, 1863. Comminuted fracture of the external and depression of the internal table of the frontal bone by a fragment of shell. Corps hospital. Removal of a portion of the external table, nearly an inch in diameter, May 7th. Death, May 13th, 1863.

WATERBURY, PETER L., Lieutenant, Co. A, 143d New York. Peach Tree Creek, July 20th, 1864. Gunshot fracture of the cranium, with depression. Corps hospital. Removal of depressed bone. Death, July 24th, 1864.

WHITMORE, GEORGE D., Private, Co. F, 37th Massachusetts, aged 25 years. Weldon Railroad, April 2, 1865. Fracture of temporal and parietal by a conoidal ball. Corps and Washington hospitals. Removal of several fragments of bone April 14th. Died on the same day.

WILBER, E. A., Private, Co. I, 50th Pennsylvania. Petersburg, October 27th, 1864. Fracture of the left parietal. Corps hospital. Bone elevated. Died while on the way to a general hospital.

In the preceding forty-five pages, three hundred and eighty-five instances of removal of fragments of the skull, after gunshot fracture, have been enumerated. One hundred and forty-five of these patients died, a mortality rate of 37.6 only. Four-fifths of the two hundred and forty patients included in the lists of recovery were disabled.

TREPHINING AFTER GUNSHOT FRACTURES OF THE SKULL.—The determination of the conditions under which operative interference is likely to be of value, after gunshot injuries of the head, is of such great importance that I shall record all the facts relating to the subject that have been reported, and detail all the accounts of formal operations for trephining performed during the war that I have been enabled to collect.

The following cases of gunshot fracture of the skull, in which trephining was practiced, had a fatal termination :

CASE.—Private Curtis Brown, Co. K, 13th New Jersey Volunteers, was wounded at the battle of Antietam, Maryland, September 17th, 1862, by a buckshot, which fractured and depressed the frontal bone, right side, a little above the frontal eminence. He was admitted into hospital No. 1, Frederick, Maryland, on the 23d, and thence transferred to the Satterlee Hospital, Philadelphia, Pennsylvania, on the 27th. The case was treated as a scalp wound until the 22d of February, when convulsions supervened. On the following day, Acting Assistant Surgeon D. Kennedy made a crucial incision one and a half inches in length near the terminus of the frontal sinus, applied the trephine, and removed a button of bone, and the missile, which was firmly imbedded in the diploic structure; also the loose fragments of the inner table. No anæsthetic was used. After the operation the flaps were brought into apposition with the silver sutures, a portion of the longitudinal incision being left open. Cold water dressings were applied to the head, and quiet enjoined. The patient rested well during the night of the 23d without the use of an anodyne, and on the following morning suffered but little pain; the pupils were normal, and responded readily to light; his appetite was good, but the pulse rather small and frequent. On the morning of the 25th, he seemed to be more stupid, and the pupils were less responsive, but the pulse was the same. The bowels being costive, an injection of warm castile soap suds and ol. ricini was administered. On the 26th, he suffered a great deal of pain in his head, and seemed indisposed to talk; the pupils failed to respond to light. The wound had no inflammatory symptoms, but was suppurating quite freely. On the following day there was less pain; the wound still suppurated quite freely; the pulse was more full and regular, the tongue slightly furred, and the appetite improved. Death ensued March 3d, 1863. The autopsy revealed the aperture made by the trephine filled with granulations springing from the dura mater. A trilocular abscess occupied the upper part of the anterior lobe of the right hemisphere contiguous to the aperture in the bone, but not communicating with it, nor opening through the dura mater. It contained about two fluid ounces of pus. A portion of the inner surface of the frontal bone in the vicinity of the abscess had been removed by absorption. The medullary substance back of the abscess, from above the middle lobe of the cerebrum to a level with the corpus callosum, was softened and yellowish from the development of pus. Inflammation of the membranes extended a short distance back of the abscess, downward from it, and at the side of the longitudinal fissure. The specimens were contributed by Acting Assistant Surgeon Joseph Leidy, and are numbered 1871 and 2219, Sect. I, A. M. M. The former shows the vault of the cranium, from which a disk has been removed with the trephine; two small fragments of the inner table remain attached, slightly depressed at their free edges. Caries and exfoliation of the superficial lamella exist externally; internally, the entire surface of the frontal and the anterior half of the right parietal show traces of diseased action, with slight ossific deposit around the edges of the opening. The latter specimen, 2219, is a wet preparation of part of the cerebrum, with a small abscess.

FIG. 123.—Depressed gunshot fracture of the right parietal bone. *Spec.* 4256, Sect. I, A. M. M.

CASE.—Private J——— B———, Co. D, 9th West Virginia Volunteers, aged 18 years, was wounded at the battle of Winchester, Virginia, July 20th, 1864, by a musket ball, which fractured and depressed the right parietal bone, near its posterior superior angle. He was admitted into the General Hospital at Cumberland, Maryland, on July 23d. During the night of the 26th, the patient had two convulsions and gradually sank into a comatose condition until on the morning of the 27th, he was entirely insensible. The wound of scalp was discharging healthy pus. Surgeon J. B. Lewis, U. S. V., trephined and removed the depressed portion of bone, giving exit to about an ounce of bloody pus. A detached fragment of the inner table, one inch square, was removed. The patient did not rally from the comatose condition and died, on the 29th, from softening of the brain and extravasation of blood. *Post-mortem* revealed a perforation of the skull at the angle of the lambdoidal suture in the parietal, which consists of one bone only in this instance, the sagittal suture not existing. A fragment of the inner table, three-fourths of an inch in length, was found driven into the brain. The pathological specimen is represented by the cut. The disk of bone removed by the trephine is *in situ* and there are two radiating fissures. The specimen and history were contributed by the operator.

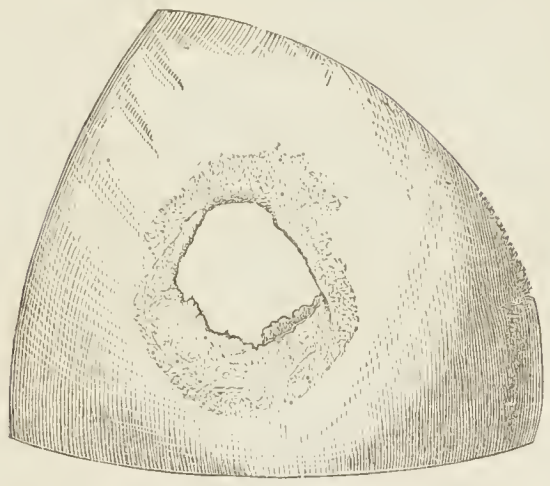

FIG. 124.—Segment of frontal bone, carious about the aperture, whence fragments have been removed. *Spec.* 3631, Sect. I, A.M. M.

CASE.—Private W. M. B———, Co. E, 83d Pennsylvania Volunteers, aged 20 years, was wounded at Petersburg, Virginia, June 20th, 1864, by a conical ball, which fractured and depressed both tables of the frontal bone just below the fronto-parietal suture and to the left of the median line. He was immediately admitted to the 1st division, Fifth Corps, hospital; on June 24th, sent to the Mount Pleasant Hospital, Washington, and thence, on the 27th, transferred to the Satterlee Hospital, Philadelphia. His pulse became slow and feeble, and on July 14th, his condition was very low. A disk of bone, one and a half inches in diameter, was removed, exposing the meninges of the brain. Pus flowed freely from the opening. The wound subsequently became gangrenous, and death ensued on July 26th, 1864. The *post-mortem* examination revealed an abscess in the left anterior lobe of the brain, with pus in the ventricles. The pathological specimen is figured in the wood-cut. The opening in the frontal bone is surrounded by a narrow ring of porous and diseased bone. The fractured portion of vitreous table measures one and a half by two inches. Two fragments remain in situ depressed one line. These fragments are covered by a thin, granular, mortar-like layer of calcareous matter. The specimen was contributed by Acting Assistant Surgeon G. P. Sargent.

CASE.—Private L——— C———, Co. B, 2d Pennsylvania Reserves, was wounded at Chantilly, Virginia, September 1st, 1862, by a round ball, which comminuted and depressed the right parietal bone, two inches below the sagittal suture. He became insensible and remained so for about fifteen minutes, when he recovered and walked about. He was admitted to the Harewood Hospital, Washington, D. C., on the 4th, having full power over his limbs and a good appetite. Gradually he began to feel depressed, then confined himself to his bed, and finally, on the 7th, was seized with paraplegia. On the evening of the 9th, he had become unconscious. A cathartic was administered, which operated freely, and the next morning the patient was fully conscious again and complained of pain in the head. At five o'clock P. M., of the following day he was unable to move, and his voice thick and inarticulate. His left side was nearly insensible, but warm, and he could protrude his tongue only partially. On examining the wound, a depression of the size of a twenty-five cent piece was found, but evidently no ball lodged in the brain. Chloroform was administered, and the fragments being so pressed into each other, that neither elevator nor forceps could remove them, the trephine was applied by Surgeon I. Moses, U. S. V., and the bone sawed nearly through, which loosened the pieces so that they were readily removed. The dura mater and surface of the brain were torn. Bleeding from a small branch of the temporal artery was easily checked, and the parts were covered with ice-cold water. Three and a half hours after the operation he had considerably improved; the severe pain which he had complained of for days previous to operation and the paraplegia were relieved. He slept soundly on the night of the 11th, but on the following morning a constant gurgling in his throat could be heard. Pus and blood were continually discharged from the wound, which looked well. He sank rapidly, became comatose on the morning of the 13th, and died in the afternoon of that day. The pathological specimen, No. 131, Sect. I, A. M. M., shows a partially trephined segment of the right parietal bone, with five fragments, embracing one square inch. The outer table and diploë were cut through, but not removed, by the trephine applied on the sound bone at the edge of the fracture. The specimen and history were contributed by Surgeon I. Moses, U. S. V.

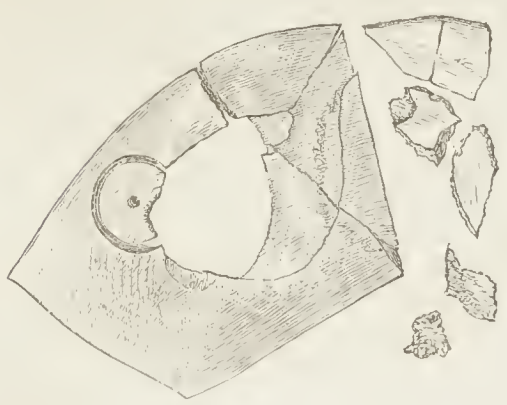

FIG. 126.—Segment of parietal bone with fragments, from a case of trephining after gunshot fracture. *Spec.* 131, Sect. I, A.M.M.

CASE.—Corporal Benjamin A. Carson, Co. E, 97th Indiana Volunteers, received, near Atlanta, Georgia, June 15th to 27th, 1864, a gunshot fracture of the skull. He was admitted to the regimental hospital. During the following night, hernia cerebri appeared, and on the next day, Surgeon J. H. Hutchinson, 15th Michigan Volunteers applied the trephine, while the patient was under the influence of chloroform. Carson was, on June 29th, sent to General Hospital, and died on July 3d, 1864.

Case.—Private P. H———, Co. E, 9th Pennsylvania Reserves, aged 28 years, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a conoidal ball, which fractured and depressed the posterior portion of the left parietal bone. He was unconscious for some time after the reception of the injury. On December 15th, he was admitted into the Stanton Hospital, Washington, D. C. A wound of scalp was discovered through which could be felt a portion of depressed bone; through another wound, two inches anteriorly, the patient stated that a portion of the ball had been extracted. No symptoms of brain lesion were manifest, the patient being perfectly conscious and answering all questions correctly and intelligently. Ice was applied to the head, but, toward evening, convulsions ensued followed by others at intervals during the night. The next morning a semi-comatose condition supervened, continuing until the 17th, when it deepened. The power of deglutition was lost, and the tongue turned to the left side of the mouth. On the 18th, the condition being unimproved, an operation was decided upon. Accordingly the patient was etherized, and Surgeon John A. Lidell, U. S. V., applied the trephine to the anterior edge of the opening in the cranium and removed a disc of bone. The depressed portion, about an inch long and three-fourths of an inch wide, and six fragments of bone were easily detached. One of the latter had evidently perforated the dura mater, its removal being followed by a discharge of disorganized brain substance. After the operation, the coma lightened somewhat and power of deglutition and consciousness were restored; the loss of speech, however, continued. The improvement was of short duration, for on the next day coma and paralysis of the right side again supervened, with convulsive twitching of the right side of face. These symptoms increased in gravity continuously, the patient becoming more and more exhausted until the 23d, when he died. At the *post mortem* examination, a thick brown-colored pus, to the amount of an ounce and a half, escaped from between the dura mater and the brain. Under the seat of injury was found red softening and disorganization of the brain extending to the depth of an inch and a half. There was also considerable effusion of clear serum in the ventricles, and a sero-sanguinolent effusion at the base of the brain. The cerebrum generally, including both right and left hemispheres, was congested, the punctiform spots being unusually distinct. The dura mater, covering the convexity of the left hemisphere, showed marks of recent inflammatory action, being injected, reddened, roughened, and of a brown color in the neighborhood of the fracture. It was also lined by a thick layer of false membrane. The specimen is figured in the wood-cut. The fractured portion of the inner table of the cranium measures three-fourths by one inch, and is partly included in the disk removed by the trephine. The outer table is injured to a less extent. The specimen and history were contributed by Surgeon J. A. Lidell, U. S. V.

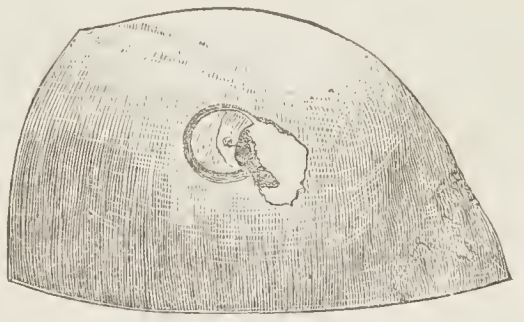

Fig. 126.—Segment of left parietal, from a patient trephined for depressed gunshot fracture. *Spec.* 534, Sect. I, A. M. M.

Case.—Private W——— H———, Co. B, 4th Michigan Volunteers, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a conoidal ball, which caused a gaping ragged wound an inch and a half long, anteroposteriorly over the left parietal, fracturing the bone. A probe could be passed through the opening so as to touch the dura mater. He was admitted to the hospital of the 1st division, Fifth Corps, and on December 16th, sent to Eckington Hospital, Washington, D. C. He was rational, but his mind was confused; the pulse was 80 and normal; the skin moderately warm; pupils somewhat contracted and fixed; some dysphagia, but no paralysis existed, and he complained of a constant tingling in his right arm and hand. On the 19th, his memory was entirely gone. The operation of trephining was decided upon; the patient was etherized, and Acting Assistant Surgeon Henry W. Fisher elongated the original wound and made another section, forming a ⊤ shaped incision. Upon turning back the flaps an extensive irregular fracture was discovered, also a small piece of bone was found driven down half its thickness below the surface. At its posterior edge a small fragment of lead was impacted. The trephine was applied and a button removed, revealing extensive comminution of the internal table toward the vertex. A tongue of bone, extending from the opening made by the trephine to a radiating fracture was removed by a Hays's saw, and two irregular fragments of the inner table, besides numerous small spiculæ, were removed. The dura mater was discolored but not lacerated save by a small puncture made by one of the spiculæ. All extraneous substances having been removed, the wound was closed and cold water dressings were applied. On December 20th, the patient was semi-comatose, but quite rational when spoken to. The next morning the pupils became contracted, the coma deepened, and all the symptoms of compression of the brain appeared. Thinking that there might be a clot under the dura mater, Dr. Fisher made a small crucial incision in the membrane, but no clot was found. The wound of the scalp and the dura mater were covered with an ash-colored, semi-fluid, sloughy matter; but on cleaning the dura mater it was found not to be sloughing, but roughened and livid. No improvement took place and the patient gradually sank until three o'clock P. M., December 21st, when he died. On removing the calvarium, the membranes were found congested, but without change of texture, save the roughening and discoloration before noted, immediately about the wound. On removing the membrane, the surface of the cerebrum was found to be in a disorganized pulpy condition for a space of an inch and a half. The convolutions were obliterated, the white and gray portions being undistinguishable, and the tissue a disorganized sanious mass, so thin that several drops ran, by their own gravity, out upon the table. The rest of the brain was healthy. This disorganization was found to extend down to a level with the lateral ventricle and inward almost to the outer margin of the ventricle. The adjacent wood-cut represents the specimen, and shows the vault of the

Fig. 127.—Calvaria and fragments from a case of trephining after gunshot fracture. *Spec.* 496, Sect. I, A. M. M.

cranium, with a disk and twelve fragments removed by the trephine from the left parietal bone. The opening of the operation measures three-fourths by one and a quarter inches, and a fissure traverses the bone diagonally from the anterior superior to the posterior inferior angle. The specimen and history were contributed by Acting Assistant Surgeon S. A. Starrow.

Case.—Corporal J. C. H———, Co. E, 2d New Jersey Volunteers, aged 37 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 14th, 1864, by a conoidal ball, which entered the lower part of the occipital bone, fractured and depressed the inner table, and lodged in the diploë, plugging up the lateral sinus on the right side of the brain. He was admitted on the same day to the hospital of the 1st division, Sixth Corps, and thence, on the 19th, sent to the Harewood Hospital, Washington, D. C. On the 21st, the parts were in a healthy condition, with a moderate amount of suppuration, and the patient's constitutional condition was remarkably good. Surgeon R. B. Boutecou, U. S. V., applied the trephine, but did not remove the ball, for fear of hæmorrhage from the lateral sinus and immediate death. The patient did not exhibit any symptoms of compression until the 26th, when he was seized with convulsions, caused by the depressed portion of bone and the pressure of the ball on the brain. The trephine was again applied, and the depressed bone was removed, but the ball had receded from sight, and could not be found. After the operation, the convulsions ceased, a passive delirium supervened and continued until the 4th of June, 1864, when death occurred. The autopsy revealed a disorganized pulpy condition of the posterior lobe of the brain, emitting an extremely offensive odor. The fracture extended from orifice of entrance to the foramen magnum. The ball was found in the posterior lobe of the cerebrum, at the depth of about two inches. The specimen is a large section of the cranium with a conoidal ball suspended in a perforation of the occipital bone. The opening measures one inch by one and one-fourth inches, and is partly caused by the operation of trephining. A fissure passes downward and inward to the foramen magnum. The specimen and history were contributed by Surgeon R. B. Bontecou, U. S. V., and are further illustrated in the Surgical Photograph Series, A. M. M., Volume VII, page 1.

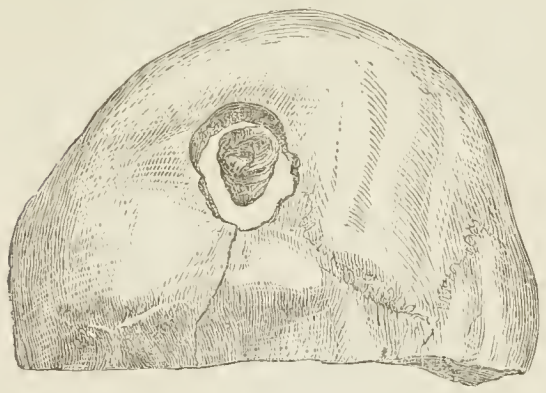

Fig. 128.—Section of the occipital bone, with a musket ball, which plugged the lateral sinus. *Spec.* 3040, Sect. I, A. M. M.

Case.—Private B——— K———, Co. G, 6th Ohio Cavalry, aged 21 years, was wounded in a cavalry skirmish near Middleburg, Virginia, June 21st, 1863, by a carbine ball, which fractured the right parietal bone near the junction of the coronal and sagittal sutures. The bone was depressed one-sixth of an inch. A portion of the ball and several spiculæ of bone were removed on the field. The patient was conveyed to Washington, D. C., and admitted into Stanton Hospital on the 24th, being perfectly conscious, but complaining of headache. The pupils were normal, deglutition good, pulse accelerated and rather feeble, and the left lower extremity paralyzed. An ice bag was applied to the head, an enema administered, and quiet enjoined. He passed a very restless night and on the following morning became delirious, with a pulse at 120. On the 26th, coma was profound, respiration sterterous, and slower than natural, the skin hot and dry, and the pulse ranging from 65 to 80. The pupil of left eye was dilated and not responsive to the stimulus of light, that of the right eye was closely contracted, and the conjunctiva injected with blood; the left leg and arm were paralyzed, the micturition involuntary. Surgeon John A. Lidell, U. S. V., made an incision two inches in length, applied the trephine on the right edge of the fracture and cut out a disc of bone, and removed, with an elevator, two fragments of depressed bone; one, about one and a half inches in length by three-fourths of an inch in breadth, embracing both tables of the skull, the other being a small fragment of the inner table. The dura mater at the posterior and external part of the opening was found to be lacerated to the extent of half an inch, and a small quantity of brain tissue escaped. The longitudinal sinus having been uncovered, a copious stream of dark-colored blood came away, apparently flowing from the open mouths of the small veins which run from the cranium into the sinus. The bleeding was checked by a pledget of lint, saturated with a solution of persulphate of iron. The pupil of the right eye expanded to the natural size and that of the left diminished and responded to the light. The engorgement of the conjunctiva of the right eye perceptibly decreased, the stertor disappeared and the breathing became more natural; the pulse rose to 110, but consciousness did not return. Ice was again applied to the head and an enema was ordered. The next morning respiration was 60 per minute, and bronchial rattles were audible throughout the chest; pulse 130, and weak; the left side of the body was rigid, while the right side was moved quite freely. There were convulsive twitchings of right side of face, which, in two hours, extended over the entire right side of the body, while the left side lost its rigidity, but was not affected by convulsive movements. In the meantime the breathing became more frequent and feeble, and the patient died at five o'clock P. M., June 27th, 1863. At the autopsy, an elongated opening in the calvaria was exposed, half an inch long and three-fourths of an inch in width, commencing one-fourth of an inch behind the coronal suture and extending backward and a little to the right of the median line. The dura mater was lacerated to the extent of half an inch at the posterior end of the chasm in the skull. On raising that portion of the dura mater which covers the convex surface of the right hemisphere of the cerebrum, a quantity of coagulated blood was found in the cavity of the arachnoid, spread out over the convexity of the right hemisphere; the largest quantity of effused blood was found at the base of the middle and posterior lobes of the right hemisphere. The effused blood, which was very dark, amounted, in all, to three ounces, and came from the longitudinal sinus. The whole brain showed very great venous congestion. There was softening of the brain tissue at the seat of injury, near the summit of each cerebral hemisphere, but it was more marked on the right than on the left side. The pathological specimen is No. 1333, and was contributed, with the history, by Surgeon John A. Lidell, U. S. V. This case is erroneously reported as a sabre cut, in bound MSS. Div. Surg. Rec. S. G. O. No. 63, p. 22.

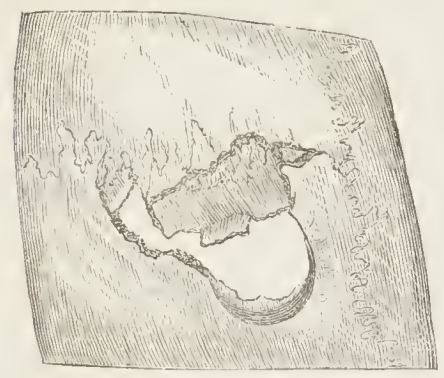

Fig. 129.—Segment of vault of cranium, trephined near the longitudinal sinus. *Spec.* 1333, Sect. I, A. M. M.

Case.—Private J. L———, Co. A, 122d Ohio Volunteers, aged 28 years, was wounded at the battle of Mine Run, Virginia, November 27th, 1863, by a conoidal ball, which entered the frontal bone, just above the inner canthus of the right eye, passed downward and inward, and made its exit through the outer wall of the left antrum of Highmore. He was treated in a field hospital for several days, and on December 4th, admitted to the 3d division hospital at Alexandria, Virginia. His condition had been good, but he soon became comatose. On December 8th, Surgeon E. Bentley, U. S. V., applied the trephine and removed a disk of bone from the centre of the frontal bone between the superciliary ridges. Splinters of bone, constituting nearly all the nasal and left malar bones, were removed at the same time. No relief was afforded, and the patient died on December 13th, 1863. The pathological specimen, which shows a section of skull trephined for extensive fracture of frontal and facial bones, together with the history, was contributed by the operator.

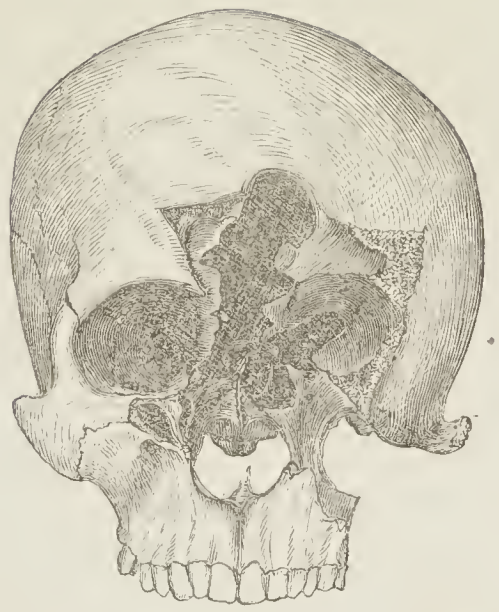

Fig. 130.—Section of a skull much shattered by gunshot, and trephined. *Spec.* 2690, Sect. I, A. M. M.

Case.—Private M. M———, Co. C, 48th Pennsylvania Volunteers, aged 45 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 12th, 1864, by a conoidal ball, which comminuted and depressed the left parietal bone near the upper border to the left of the longitudinal sinus. He was admitted to the hospital of the Ninth Corps and thence sent to the Carver Hospital, Washington, on the 14th, somewhat morose and taciturn, and at times manifesting slight symptoms of compressions, but expressing himself quite intelligibly. On the evening of the 15th, he became decidedly comatose. On the following morning the patient was placed under the influence of ether. Acting Assistant Surgeon J. O. French trephined the skull over the affected region and removed several large splinters of the external table. The depressed portion was of an irregular quadrangular shape, measuring an inch or more in its longest diameter, and was firmly imbedded in the brain. The membranes and medullary substance of the brain were lacerated by the depressed fragments, accounting for the slight oozing of medullary substance and blood that had existed ever since his admission. Considerable hæmorrhage occurred during the operation, which was controlled by dry lint. The operation relieved the patient from his comatose condition, and he became quite animated, remaining so until the 18th, when coma again set in. Death supervened on the 20th. The autopsy revealed traces of meningeal inflammation and infiltration of purulent matter in the region of the injury. The left lateral ventricle was distended with blood, and a small piece of bone was found projecting into its cavity. The pathological specimen is a disk and three fragments of bone, removed from the cranium. The largest fragment is from the inner table and measures one inch in diameter. The specimen and history were contributed by Surgeon O. A. Judson, U. S. V.

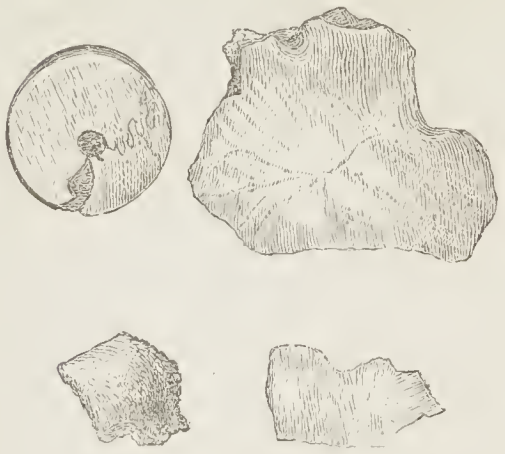

Fig. 131.—Disk and fragments of skull removed by trephining. *Spec.* 2302, Sect. I, A. M. M. [Nat. size.]

Case.—Private A——— M———, Co. D, 155th Pennsylvania Volunteers, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a conoidal musket ball, which entered at the juncture of coronal and squamous sutures, and lodged. He was admitted to the Patent Office Hospital, Washington, D. C., on the 17th, complaining but very little of his wound, and was able to walk about until the 19th, when the pain became so severe that he was compelled to take to his bed. He became restless, showing all the symptoms of febrile excitement. A lotion of lead water and laudanum was ordered to be applied to the wound, and an anodyne administered. Up to this time he had not been delirious and was able to give rational answers to all questions. On the morning of the 20th, he was comatose and all the symptoms of compression of the brain were well marked; his eyeballs, especially the right, were prominent and the pupils fixed and contracted. On removing the dressing, blood and brain substance oozed from the wound. The wound of the scalp was then enlarged and the skull trephined; spiculæ of bone were removed, causing considerable hæmorrhage, but no relief to the patient. He died a few hours after the operation. The *post-mortem* examination revealed cerebro-meningitis, advanced to the stage of suppuration, pus having collected over the anterior surface of the brain, and between the pia mater and arachnoid. The ball had lacerated the anterior portion of the middle lobe of the brain, the terminal branches of the internal carotid, and the anterior branch of the temporal artery. There was a large clot on the floor of the middle fossa of the cranium. A fragment of the ball was found in the centre of the middle lobe of the cerebrum, and the remaining portion was imbedded in the sphenoid bone. The pathological specimen is figured in the wood-cut. The opening in the cranial wall measures one inch from above downward and is three-fourths of an inch wide; from this point one fissure passes downward across the glenoid cavity and a second forward into the external wall of the right orbit, which is comminuted. The ball is encrusted with calcareous matter. Acting Assistant Surgeon J. H. Jamar contributed the specimen and history.

Fig. 132.—Segment of cranium and portion of lower maxilla, and round musket ball. The skull was trephined. *Spec.* 685, Sect. I, A. M. M.

Case.—Private Edward Norton, Co. I, 39th New Jersey Volunteers, aged 21 years, was wounded at Petersburg, Virginia, April 2d, 1865, by a shell which fractured the right parietal bone. He was conveyed to the field hospital of the 2d division, Ninth Corps, thence sent to City Point, Virginia, where he remained until the 6th, when he was conveyed to the Fairfax Seminary Hospital, Virginia. No symptoms of compression existed. The external wound was one and a half inches in length and had a bad appearance. Water dressings were applied and beef tea ordered. On the 8th, the patient's appetite failed, deglutition became difficult, and symptoms of effusion appeared on the following day. Surgeon D. P. Smith, U. S. V., applied the trephine and removed a portion of the cranium and several fragments, greatly relieving the symptoms. The patient talked better and answered questions correctly. Hernia cerebri was first noticed on the morning of the 11th, and on the 12th, a slight hæmorrhage occurred. Coma followed; the protruding hernia was removed, but death ensued on April 14th, 1865. The case is reported by Surgeon David P. Smith, U. S. V.

Case.—Corporal E. B. P———, Co. H, 14th Connecticut Volunteers, aged 20 years, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a musket ball, which fractured both tables of the *os frontis* in the median line, one inch below the anterior extremity of the sagittal suture. He was admitted to the Amory Square Hospital, Washington, on the 20th. Symptoms of compression of the brain appeared in a few days. An examination revealed a piece of lead, impacted in the *os frontis*, one half of an inch below the anterior extremity of the sagittal suture. On the 29th, Surgeon D. W. Bliss, U. S. V., applied the trephine over the seat of injury and removed the portion of bone containing the fragment of lead, giving exit to a large quantity of sanguineous pus. Immediately beneath the trephined portion of bone, a depressed fragment of the inner table was found, measuring three-fourths of an inch in diameter, which was removed. Cold water dressings were applied, cathartics administered, and low diet ordered. The patient lingered in a semi-comatose condition until the 31st, when death ensued. The autopsy revealed the internal table much fractured, and spiculæ driven into the substance of the brain. A large collection of pus existed beneath the dura mater. The pathological specimen is 625, Sect. I, A. M. M., and was contributed, with the history, by Surgeon D. W. Bliss, U. S. V.

Case.—Private Willard P———, Co. I, 120th New York Volunteers, aged 18 years, was wounded near Hatcher's Run, Virginia, March 25th, 1865, by a conoidal ball, which fractured and depressed the right parietal bone near the sagittal suture. He was, on the same day, taken to the hospital of the 3d division, Second Corps, and thence conveyed to Washington, and admitted to the Emory Hospital, on the 5th of April. On the following day, he was placed under the influence of chloroform, and Surgeon N. R. Moseley, U. S. V., trephined and elevated the fractured portion of the parietal bone. Cold water dressings and compresses were applied, enemas administered, and nutritious diet ordered. On the 13th, the patient was apparently doing well, but death supervened on April 17th, 1865, from exhaustion. The pathological specimen is No. 4074, and shows a disc and two fragments of bone from the right parietal. The fragments are chiefly from the inner table, and include one-half square inch of surface. The specimen and history were contributed by Surgeon N. R. Moseley, U. S. V.

Case.—Corporal H. L. P———, Co. I, 1st Massachusetts Heavy Artillery, aged 20 years, was wounded at Petersburg, Virginia, June 17th, 1864, by a conoidal ball, which struck the left parietal bone at its posterior superior portion, causing, apparently, only a wound of the scalp two inches in length. He was conveyed to Washington, and admitted to the Harewood Hospital on June 21st, and thence transferred, on the 27th, to the Satterlee Hospital, Philadelphia. He appeared to be perfectly well, but on the morning of the 3d of July, he was found speechless and paralyzed. An examination revealed the cranium denuded of its periosteum and several small pieces of lead firmly fixed in the bone. Acting Assistant Surgeon W. F. Atlee applied the trephine and removed a portion of the outer table of the cranium at the seat of injury. Some improvement in the motions of the tongue was noticed and further proceedings were suspended. On the following day the inner table was trephined, revealing an oval shaped fissure one inch in its long, and half an inch in its short diameter, which would admit the introduction of a finely pointed quill toothpick. The bone, inclosed by the fissure, which was loosened and depressed, was removed. No relief, however, was afforded, and death occurred July 7th, from compression of the brain. The patient had been perfectly rational throughout the treatment. An autopsy revealed a large abscess filled with pus extending from the top of the left cerebral hemisphere to its base. The pathological specimen is No. 3635, Sect. I, A. M. M., and was contributed by Acting Assistant Surgeon George Kerr, who reports the case.

Fig. 133.—Skull-cap, trephined for gunshot fracture. *Spec.* 1310, Sect. I, A. M. M.

Case.—Corporal G. H. S———, Co. C, 18th Massachusetts Volunteers, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a conoidal musket ball, which fractured and depressed the frontal and the left parietal bones at the junction of coronal and sagittal sutures, one inch from the median line. He was immediately admitted to the Fifth Corps field hospital, and transferred, on May 9th, to the Finley Hospital, Washington, in good condition, with slight cerebral symptoms. On the 15th, he was placed under the influence of ether; the trephine was then applied and the external table elevated, but further operation was suspended, as no fracture or depression of the inner table could be discovered. On the next morning convulsions occurred and continued at intervals. The patient became insensible and the pupils dilated. Erysipelas of the scalp and face supervened; and these symptoms continued unchanged until May 17th, 1863, when death occurred. The *post-mortem* examination revealed a stellate fracture and slight depression of the inner table of the frontal and left parietal bones, but more extensive than that of the outer table. The brain under and around the injury was considerably discolored, and softened in both hemispheres. The pathological specimen, with its history, was contributed by Acting Assistant Surgeon Alfred Edelin.

CASE.—Private Jacob Smith, Co. D, 48th Pennsylvania Volunteers, aged 33 years, was wounded in the engagement near Fort Steadman, Virginia, April 2d, 1865, by a conoidal musket ball, which struck the centre and upper part of the frontal bone, making a vertical incision of the scalp two inches in length. The pericranium was only slightly detached and no fracture was observable. He was taken to the hospital of the 2d division, Ninth Corps; on April 4th, sent to Carver Hospital, Washington, and on May 19th, transferred to Mower Hospital, Philadelphia. Three days later, the right temporal region became swollen, and erysipelas, attended with high fever, quick pulse, and delirium, supervened. An abscess being suspected, an incision was made in the temple, but none could be found. A brisk cathartic was given, and the face and head dressed with sol. sod. sulph. On May 24th, the left side of the head became involved and head symptoms developed rapidly. Chloroform being administered, a crucial incision was made by Acting Assistant Surgeon W. P. Moon, and the bone exposed, when the slightest perceptible fissure in the external table was discovered, from which a thin sanious discharge was issuing. Upon removing a portion of the two tables with a trephine, it was ascertained that the fissure extended through both tables, without fracturing or depressing either. Quite an amount of pus escaped from the orifice and considerable disorganization was evident. Death occurred on May 25th, 1865. At the autopsy, the interior lobes were found greatly congested, with formation of pus over a great extent of the longitudinal sinus. All the vessels of the membranes were much enlarged and engorged, and at the point of injury disorganization had taken place. The case is reported by the operator, Acting Assistant Surgeon W. P. Moon.

CASE.—Lieutenant W. V———, Co. L, 1st Maine Heavy Artillery, aged 30 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 17th, 1864, by a conoidal ball, which fractured and depressed both tables of the left parietal bone. He was admitted into the Emory Hospital, Washington, on the 22d, in a comatose condition, with paralysis of the right side. The scalp was lacerated and sloughing, the pericranium torn, and spiculæ of bone had been driven in upon the dura mater. The membranes of the brain were entire. Surgeon N. R. Moseley, U. S. V., applied the trephine, removed two fragments of bone and elevated the depressed portions. Beef tea and liquid stimulants were administered. Inflammation of the meninges supervened, and the patient died on the 24th of May, 1864. The *post-mortem* examination revealed a fracture, extending from the opening made by the trephine toward the left parietal bone. The substance of the brain was softened and congested with dark, livid blood. The pathological specimen, No. 2317, Sect. I, A. M. M., shows a disk and five small fragments of bone removed from the left parietal. The disk is split transversely. The specimen and history were contributed by Surgeon N. R. Moseley, U. S. V.

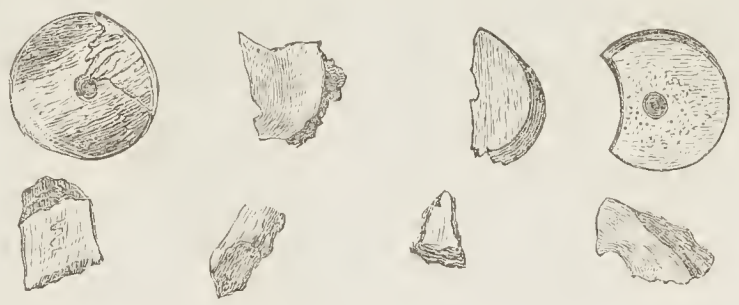

FIG. 134.—Disks and fragments removed from left parietal. *Spec.* 2317, Sect. I, A. M. M. [Nat. size.]

CASE.—Private J——— W———, Co. K, 1st Michigan Volunteers, aged 30 years, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a missile supposed to have been a musket ball. On admission to the Hammond Hospital, Point Lookout, Maryland, December 16th, a lacerated wound of the scalp was found, of triangular shape, with the apex situated anteriorly on the inferior border of the right parietal bone, an inch above the top of the ear. At the base of the wound a fracture and depression of both tables of the skull was detected, the fracture covering an irregular space of about an inch in diameter. The patient experienced little or no uneasiness from the injury, and all symptoms of cerebral lesion were absent. The wound was dressed with cold water, and rest and low diet ordered. No change took place until the 27th, when the man became drowsy and could be aroused to answer questions only with great difficulty, relapsing immediately into a sleepy condition. The pupils were somewhat dilated, and he complained of a feeling of numbness in the whole left side of his body; there was, however, no complete paralysis; pulse about 60 and natural. Chloroform was administered, the seat of fracture exposed, and Acting Assistant Surgeon Charles L. Hogeboom applied the trephine at the posterior border and removed several depressed fragments. The symptoms of compression disappeared, and the case progressed favorably until the 5th of January, 1863, when the signs of compression returned, the patient becoming partially insensible and inclined to vomit. The breathing became stertorous, the pupils dilated, and the pulse weak and irregular. He sank rapidly and died on the following day. No marked paralysis existed at any time, the nearest approach being the feeling of numbness mentioned on the day of the operation. On removing the scalp, at the autopsy, two fissures were discovered diverging from the seat of the fracture; one passing from near where the trephine was applied backward across the lateral and posterior aspect of the skull, and ending just above the external occipital protuberance, the other commencing at the anterior border of the opening in the skull and passing forward and downward for the distance of an inch. The dura mater was entire, but softened at the seat of the fracture. The cerebral substance was softened to the depth of one-fourth of an inch and of a yellowish color. There was, also, considerable injection of the vessels of the membranes and of the substance of the brain. The ventricles were filled with serum. The specimen, which is illustrated in the annexed wood-cut was contributed, with the history, by Assistant Surgeon Clinton Wagner, U. S. A.

FIG. 135.—Calvaria trephined for gunshot fracture. *Spec.* 924, Sect. I, A. M. M.

CASE.—Sergeant A——— B———, Co. A, 5th Michigan Volunteers, aged 24 years, was wounded at the battle of Mine Run, Virginia, November 27th, 1863, by a conoidal ball, which fractured the right side of the frontal bone just below the temporal ridge. He remained in the field hospital until the 4th of December, when he was transferred to the 3d division hospital, Alexandria, Virginia, in a perfectly natural condition. He continued so until the 8th, when the skull was trephined. The ball

had been removed on the field. For forty-eight hours after the operation, he was, at intervals slightly delirious; he recovered at the end of that time, and continued in full possession of his mental faculties until the 14th, when stupor and coma supervened; he died on the same day. The pathological specimen is No. 2612, Sect. I, A. M. M. Fragments have been removed from the cranium for a space measuring one by one and one-fourth inches. The inner surface of the edge of the opening is slightly cribriform. There is no fissuring. The history and specimen were contributed by Surgeon E. Bentley, U. S. V.

Case.—Private J. H. D———, Co. B, 2d New York Heavy Artillery, received, at Cold Harbor, Virginia, on the 7th of June, 1864, a gunshot fracture of the right parietal bone causing slight depression. He was at once admitted to the 1st division, Second Corps, hospital, and transferred to the Fairfax Seminary Hospital, Virginia, on June 9th, complaining of headache. Surgeon D. P. Smith, U. S. V., applied the trephine and removed a disk and six fragments of bone. Water dressings were applied to the wound, which suppurated freely. An abscess formed in the brain, and the patient died on June 10th, 1864. The pathological specimen is No. 3305, Sect. I, A. M. M., and was contributed by the operator.

Case.—Private James A. Winn, Co. B, 13th Tennessee Cavalry, aged 22 years, was wounded at Fort Pillow, Tennessee, April 12th, 1864, by a rifle ball which passed from right to left, across the top of the head, fracturing the cranium. On the 14th, he was admitted into the general hospital at Mound City, Illinois. During the night of the 16th, he had a severe headache, but otherwise was doing well until twelve o'clock P. M. of the 19th, when he became delirious. Hæmorrhage from the middle meningeal artery occurred, causing a loss of about twenty-four ounces of blood. Spasms supervened. On the following morning the patient was placed under the influence of ether and chloroform, and Surgeon Horace Wardner, U. S. V., applied the trephine over the left parietal bone, half an inch to the left of the sagittal suture, elevating a piece of bone one inch in diameter. Three or four ounces of blood were lost during the operation. Paralysis of both extremities of the right side set in, and the convulsions continued until twelve o'clock M., of the 21st, when death supervened. At the *post mortem* it was ascertained that the ball had passed through the cranium, but the missile could not be found. A piece of the inner table, one inch in length and three-fourths of an inch in width, was entirely detached and was adherent to the dura mater. Extensive extravasation of blood and serous effusion of water to the amount of three ounces existed under the left parietal bone. The pathological specimen is No. 3308, Sect. I, A. M. M., and was contributed, with the history, by Surgeon H. Wardner, U. S. V.

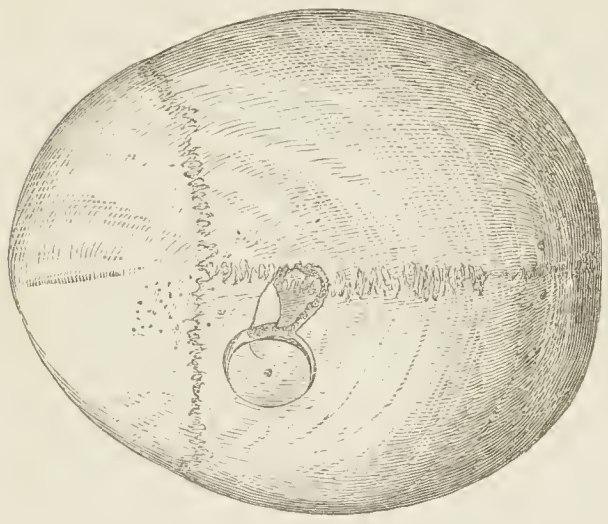

Fig. 136.—Calvaria trephined for depressed fracture by a musket ball. *Spec.* 3308, Sect. I, A. M. M.

Case.—Private Frederick E———, Co. M, 4th Pennsylvania Cavalry, aged 38 years, was wounded near Petersburg, Virginia, November 25th, 1864, by a conoidal ball, which penetrated the right parietal bone near the superior border and emerged near junction of the occipital and parietal bones. He was admitted to the hospital of the 2d division, Cavalry Corps, on December 1st; on the 9th, sent to the Cavalry Corps Hospital, Army of the Potomac, and on the 15th, transferred to the Armory Square Hospital, Washington. On December 18th, he was placed under chloroform and his skull trephined by Surgeon D. W. Bliss, U. S. V. The edges of the wound were brought together with straps, and the patient rallied well from the operation. During the following day he complained of pain in the head and was slightly delirious. On the morning of the 20th, he ate a hearty breakfast, then fell into a profound stupor, from which he never recovered. Complete paralysis of the left arm and partial paralysis of the left leg supervened; hernia cerebri also appeared, and death occurred on December 20th, 1864. The pathological specimen is No. 3516, Sect. 1, A. M. M., and consists of a disk of bone from the parietal one inch in diameter. The specimen and history were contributed by Surgeon D. W. Bliss, U. S. V.

Case.—Private H. A———, Co. B, 36th Illinois Volunteers, aged 22 years, was wounded at Resaca, Georgia, May 14th, 1864, by a conoidal ball, which fractured and slightly depressed the right parietal bone at its centre. He was admitted on the same day to the hospital of the 2d division, Fourth Corps; transferred to Chattanooga, May 16th, and thence sent to Hospital No. 1, Nashville, Tennessee, on the 19th. He complained of a dull pain in the head, which continued until the 18th of June, when he became comatose. On June 21st, Acting Assistant Surgeon H. C. May applied the trephine over the seat of fracture, and removed several fragments of necrosed bone from the meninges. The tissues had been destroyed by gangrene over a space of about two inches in every direction from the wound, which was granulating finely. The patient never fully reacted after the operation; he became lethargic, sank rapidly, and died on June 22d, 1864. At the autopsy, the membranes beneath the fracture were found dark colored and thickened. Beneath this and in the substance of the hemisphere existed a large abscess, which communicated with the lateral ventricles, and was filled with highly offensive pus. The specimen is figured in the wood-cut, and consists of a disk and six fragments of bone, embracing about one-half square inch of the parietal bone. The specimen and history were contributed by Acting Assistant Surgeon H. C. May.

Fig. 137.—Disk and fragments removed from right parietal after gunshot fracture. *Spec.* 3362, Sect. I, A. M. M.

CASE.—Private James Addison, Co. B, 19th United States Colored Troops, received, near Petersburg, Virginia, August 19th, 1864, a severe gunshot wound of the cranium. He was admitted to hospital 4th division, Ninth Corps, where the trephine was applied, and three inches of the occipital and left parietal bone were removed. He died on August 19th, 1864.

CASE.—Private James Bans, Co. E, 17th Maine Volunteers, aged 23 years, was wounded at the battle of Mine Run, Virginia, November 27th, 1863, by a conoidal ball, which fractured and depressed both tables of the left parietal bone. He was admitted into the 3d division hospital, Alexandria, Virginia, on December 5th. He was speechless; still could be aroused sufficiently to answer by signs, but would immediately relapse into stupor. His pulse was slow, soft, and irregular; bowels torpid, and deglutition difficult. On the following day, Surgeon Edwin Bentley, U. S. V., removed the depressed portion of bone with the trephine, while the patient was under the influence of ether. He recovered his speech after the operation, and complained of pain in his head. On the 10th his right lung became painful; stupor gradually supervened, extensive inflammation set in, and death ensued on the 13th of December, 1863. The autopsy revealed effusion of coagulable lymph and serum into the cavity of the arachnoid, and the brain softened and congested. Acting Assistant Surgeon W. G. Elliott reports the case.

CASE.—Private Frederick Buck, Co. D, 52d Pennsylvania Volunteers, was wounded at the battle of Fair Oaks, Virginia, May 31st, 1862, by a conoidal ball, which penetrated the left side of the *os frontis*, and lodged in the brain substance. He was admitted to the hospital of Gen. Casey's Division, Fourth Corps, and thence transferred to the general hospital at Newport News, Virginia, on June 4th, 1862, in a comatose condition. The skull was trephined, and the ball and fragments of bone were removed, but death ensued on June 9th, 1862. The case is reported by Surgeon A. B. Shipman, U. S. V.

CASE.—Private Jasper W. Burton, Co. C, 7th West Virginia Volunteers, aged 23 years, received, near Swift Run, Virginia, May 30th and 31st, 1864, a gunshot depressed fracture of the frontal bone. He was admitted to the hospital of the 3d division, Second Corps, where the operation of trephining was performed by Surgeon H. A. Martin, U. S. V. The patient died shortly afterward.

CASE.—Private Henry S. Brandt, Co. K, 7th Connecticut Volunteers, aged 32 years, was wounded at Bermuda Hundred, Virginia, June 2d, 1864, by a conoidal ball, which fractured and depressed the cranium over the longitudinal sinus. He was admitted on the 4th into the general hospital at Hampton, Virginia, and transferred on June 8th, entering DeCamp Hospital, David's Island, New York Harbor, on the 10th. Coma had supervened on the 19th, when Assistant Surgeon Warren Webster, U. S. A., applied the trephine, and removed a portion of the fractured bone, revealing extensive comminution of the inner table. Simple dressings were applied, but death occurred a few hours after the operation, from compression of the brain. A *post-mortem* examination revealed the brain much engorged.

CASE.—Private John Blood, Co. A, 7th New York Artillery, was wounded at Deep Bottom, Virginia, August 14th, 1864, by a shell, which severely injured the cranium. He was admitted to hospital 1st division, Second Corps, where the trephine was applied and pieces of bone were removed. He was taken on board of a transport on August 18th, 1864, but died shortly afterward.

CASE.—Captain Allen A. Burnett, Co. K, 37th Wisconsin Volunteers, aged 38 years, was wounded at Petersburg, Virginia, July 30th, 1864, by a shell, which fractured the frontal bone, right side; he received at the same time a wound in the left shoulder. The skull was trephined upon the field by Surgeon W. B. Fox, 8th Michigan Volunteers, and the patient was sent to Washington, entering Armory Square Hospital on August 1st. Hæmorrhage occurred on August 14th, from one of the branches of the cerebral arteries and was arrested by a ligature. His strength gradually failed, and death occurred on August 16th, 1864. The case is reported by Surgeon D. W. Bliss, U. S. V.

CASE.—Corporal Orville Bannister, Co. I, 8th New York Heavy Artillery, aged 18 years, was wounded at the battle of Petersburg, Virginia, June 22d, 1864, by a piece of shell, which caused a penetrating fracture of the cranium. He was admitted to the 2d division, Second Corps, hospital, where the trephine was applied by Surgeon S. Hiram Plumb, 82d New York Volunteers. The patient was transferred to the Campbell Hospital, Washington, June 28th, and died on July 1st, 1864.

CASE.—Corporal George C. Chase, Co. F, 8th New York Heavy Artillery, aged 21 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a fragment of shell, which fractured the cranium, driving about sixty fragments of bone through the dura mater to the depth of about half an inch into the brain substance. He was, on the same day, admitted to the hospital of the 2d division, Second Corps; on June 8th, transferred to the Columbian Hospital, Washington; and on June 19th, sent to the McDougall Hospital, New York Harbor. Inflammation of the brain set in, and, on June 30th, chills occurred. On July 4th, fragments of bone were removed, and on July 7th, the operation of trephining was performed. Death occurred on July 7th, 1864.

CASE.—Private Milford Clark, Co. C, 125th New York Volunteers, aged 20 years, was wounded at Spottsylvania, Virginia, May 18th, 1864, by a conoidal ball, which struck the cranium half an inch above the frontal eminence, and passed posteriorly four inches, lacerating the scalp in its course. He was admitted into the 1st division, Second Corps, hospital on the same day, and thence sent to the Armory Square Hospital, Washington, on the 28th, where the wound was carefully examined and a fissure of the outer table one inch in length, discovered. The operation of trephining was at once instituted, and the depressed portion of the inner table elevated. Death, preceded by coma, however, ensued on June 25th. Surgeon D. W. Bliss, U. S. V., reports the case.

CASE.—Private William Cole, Co. I, 50th Pennsylvania Volunteers, was wounded at the siege of Knoxville, Tennessee, November 19th, 1863, by a conoidal ball, which penetrated the brain. He was conveyed to the field hospital of the Ninth Corps, where Surgeon James P. Prince, 36th Massachusetts Volunteers, trephined the skull, and removed a piece of bone one inch in diameter. Death supervened on December 2d, 1863.

Case.—Private Joseph Cowan, Co. G, 78th Ohio Volunteers, was wounded at Bear Creek, Mississippi, February 5th, 1864, by a shell, which fractured the cranium at its vertex. He was immediately conveyed to a field hospital in the vicinity, where Surgeon W. S. Edgar, 32d Illinois Volunteers, trephined the skull. Death took place on February 6th, 1865.

Case.—Private *R. F. C*———, 18th Mississippi Regiment, aged 28 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a musket ball, which penetrated the cranium near the upper edge of the left temporal bone. Trephining was performed, and the ball removed on the 10th. He was conveyed to the Confederate general hospital at Charlottesville, Virginia, and the case progressed well, without any symptoms of constitutional disturbance, until July 3d, when he was seized with general convulsions, which lasted with great severity for some fifteen minutes, and were succeeded in about an hour by a second attack. There was no perceptible cause, but the patient had complained of headache all the morning. The convulsions recurred frequently; at first with irregular intervals until the 15th, the later ones being slight. On the 5th, a cathartic and enema were administered, producing a copious discharge. The bowels were kept regular by cathartics, stimulating diet given, and cold applications were made to the head. There was loss of power in the right arm, with partial paralysis of the right side, impaired speech, and imperfect ideas. On the 8th, several fragments of both tables were removed through a straight incision about one and a half inches in length, and on the following day a small spicula resting on the brain was removed. His speech had improved by the 11th, memory and ideas by the 13th, and the wound was nearly healed, but again began to discharge on the 15th, and on the 18th it was examined, and a spicula removed. The head symptoms seemed to increase on the 19th, and patient appeared languid and confused, and was disposed to keep the head low; the wound was nearly healed and not discharging. A severe rigor occurred at three o'clock P. M. of the 21st, and patient seemed to be suffering pain; wound discharging a sanious pus. An incision was made over the seat of injury, and an exploration with probe revealed a large abscess, which was emptied of about two ounces of purulent matter. He passed a very restless night, and on the following morning was greatly prostrated; pulse 100 and feeble; extremities cool; anorexia complete; nausea. Egg-nogg, one ounce every two hours, was ordered, and under its influence reaction was fully established at five o'clock P. M.; face flushed; pulse 120. Patient died at five o'clock A. M. on the 23d, without any marked change in his condition during the night. At the autopsy, the opening through both tables of the frontal bone, over the seat of injury, measured one and one-fourth inches from the line of sagittal suture at supra-posterior angle of the left half of the frontal bone. A widely separated fissure extended from the lower border of the oval opening, and parallel with the line of sagittal suture, down to the supra-orbital ridge; thence obliquely through the orbital plate of the foramen cæcum. The frontal sinus was found filled with pus. Upon examining the brain and its membranes, a spicula of bone was found imbedded in the dura mater, and resting upon the brain. The membranes were much discolored and injected for some distance around the seat of injury. The substance of the brain was found to be softened for an inch around the circumference of the ragged opening in the dura mater. A large cerebral abscess two and a half inches deep by one and a half inches in diameter existed, from which the pus had been evacuated. Purulent lymph was found effused over the pons Varolii, and an abnormal quantity of serous fluid in the lateral ventricles.

Case.—Private Patrick Condon, Co. B, 27th Connecticut Volunteers, received, at the battle of Fredericksburg, Virginia, December 13th, 1862, a gunshot fracture of the right side of the cranium. He was conveyed to Washington, and on December 25th admitted to Douglas Hospital, where the skull was trephined. He died on December 28th, 1862.

Case.—Private Matthew Cantwell, Co. B, 3d Minnesota Volunteers, received, on September 22d, 1862, a gunshot fracture of the left side of the frontal bone, exposing the brain. He was admitted to the post hospital at Fort Ridgely, Minnesota, where trephining was performed. He died on October 11th, 1862.

Case.—Private Joseph Condant, Co. H, 48th New York Volunteers, aged 37 years, was wounded at Olustee, Florida, February 20th, 1864, by a round musket ball, which fractured and depressed the frontal bone at its centre. He was taken on board the hospital transport Cosmopolitan and conveyed to Beaufort, South Carolina, entering Hospital No 4, on the 23d, whence he was returned to his regiment on April 19th, 1864. On April 24th, he was admitted into the Hampton Hospital, Fort Monroe, Virginia, from Yorktown, as a convalescent from gunshot wound of forehead, and on April 26th, sent north. He entered DeCamp Hospital, David's Island, New York Harbor, on the 29th of April, and remained there until October 30th, when he was transferred to the Ladies' Home Hospital, New York City. The wound had entirely healed; but the patient suffered from tertian intermittent fever and epilepsy, the latter resulting from depressed bone. About four weeks after his admission the wound reopened, and on December 29th, the patient being greatly depressed from the recurrence of convulsions, Surgeon Alexander B. Mott, U. S. V., cut down upon the anterior and middle portion of the frontal bone, when it was found that the external table had exfoliated to the extent of a ten cent piece. The inner table was trephined, and the depressed portions of bone were removed; but no relief was afforded, and death occurred on the same day, a few hours after the operation. The case is reported by Surgeon A. B. Mott, U. S. V.

Case.—Private Joseph Dupont, Co. G, 37th Wisconsin Volunteers, aged 32 years, was wounded near Petersburg, Virginia, April 2d, 1865, by a conoidal ball, which fractured the left parietal bone. He was immediately conveyed to the field hospital of the 1st division, Ninth Corps, where the operation of trephining was performed the same day by Surgeon W. C. Shurlock, 51st Pennsylvania Volunteers. About one-tenth of the bone was removed. He was, on April 7th, transferred to Campbell Hospital, Washington. The wound was doing well, but the patient was suffering from inflammation of the right lung and pleura. He was transferred to Stanton Hospital on July 8th, where he died on September 2d, from phthisis.

Case.—Corporal Joel Duel, Co. D, 37th Wisconsin Volunteers, was wounded near Petersburg, Virginia, July 27th, 1864, by a musket ball, which fractured and depressed the cranium at the junction of the sagittal with the coronal suture. He was conveyed to the field hospital of the 3d division, Ninth Corps, where the operation of trephining was performed. Death supervened on July 29th, 1864, the day following the operation. The case is reported by Surgeon W. C. Shurlock, 51st Pennsylvania Volunteers.

Case.—Corporal P. J. Doremus, Co. G, 7th New Jersey Volunteers, aged 24 years, received, at Petersburg, Virginia, June 17th, 1864, a gunshot depressed fracture of skull, just posterior to the junction of the sagittal and coronal sutures. He was admitted to the hospital of the 3d division, Second Corps; on the 21st sent to the Carver Hospital, Washington, and on the 28th transferred to the Mower Hospital, Philadelphia. Until July 3d, the patient's health was excellent and no fracture was suspected; after that a complete state of stupor ensued, and, on July 6th, Acting Assistant Surgeon J. H. Jamar made a crucial incision through the scalp, applied the trephine, and removed one-fourth of an inch of bone from the point of depression. A large amount of pus, mingled with blood, escaped through the opening made in the bone, but failed to relieve the symptoms of compression. Sinapisms were applied to the feet and neck, and extract of helebore, tartrate of antimony and potassa, calomel and brandy administered internally. The patient sank rapidly, and died a few hours after the operation, July 6th, 1864. The autopsy revealed two ounces of pus anterior to, and to the left of, the fracture; also considerable softening of the right lobe. The case is reported by Surgeon J. Hopkinson, U. S. V.

Case.—Private George W. Derrick, Co, B, 45th Pennsylvania Volunteers, was wounded near Petersburg, Virginia, July 30th, 1864, by a fragment of shell, which fractured the cranium. He was admitted to the hospital of the 2d division, Ninth Corps, where the skull was trephined. He died August 4th, 1864.

Case.—Private *John Eisin*, Co. E, 38th Georgia Regiment, was wounded at Cedar Creek, Virginia, October 19th, 1864, by a shrapnel shot, which caused a compound fracture of the skull and middle third of the left arm. He was taken prisoner, conveyed to Winchester, Virginia, and placed in the depot field hospital of the Nineteenth Corps, where fragments of the cranium were elevated and splints applied to the arm. Death ensued October 24th, from gangrene of the brain.

Case.—Private Gottlieb Feisel, Co. K, 47th Pennsylvania Volunteers, was wounded at the battle of Pocotaligo, South Carolina, October 22d, 1862, by a fragment of shell, which apparently inflicted a wound in the scalp on the left side of the cranium, extending three inches from before backward over the coronal suture. He was admitted into the general hospital at Hilton Head, South Carolina, on the following day, when the head was shaved, and the edges of the wound were brought into apposition and secured with sutures and adhesive straps. No symptoms of depression appeared until the morning of the 27th, when convulsion supervened. Acting Assistant Surgeon Thomas T. Smiley made a crucial incision, and upon dissecting the flap discovered that the parietal bone had been fractured and a portion been driven in upon the brain. The trephine was applied and a triangular piece of the internal table, one by one and a half inches, extracted. The dura mater was not ruptured. The symptoms of compression immediately disappeared, and for four or five days the progress was favorable, but meningitis supervened, and death resulted on November 9th, 1862. The case is reported by the operator, Acting Assistant Surgeon T. T. Smiley.

Case.—Private Frederick Gothe, Co. H, 11th Illinois Volunteers, was wounded near Vicksburg, Mississippi, May 20th, 1863, by a conoidal ball, which fractured the cranium at the junction of lambdoidal and sagittal sutures. He was, on May 22d, admitted to the regimental hospital, and on the 27th sent to Jackson Hospital, Memphis, Tennessee. On the following day great stupor, inability to answer questions, and profuse diarrhœa, with involuntary discharges, supervened. Simple dressings were applied to the wound, and diarrhœa mixture ordered. On June 1st, no change in condition had occurred, and on June 3d, the trephine was applied, and some fragments of bone were removed, giving exit to an ounce of pus from the interior of the cranium. The operation failed to relieve the symptoms; diarrhœa returned on the 6th, patient's strength began to fail, and the discharge from the wound became very profuse. Death supervened on June 7th, 1863. The autopsy revealed an extensive abscess at the inner border of the left hemisphere of the posterior lobe of cerebrum. The dura mater had sloughed off at the junction of sagittal and lambdoidal sutures.

Case.—Private *John J. Gay*, Co. G, 64th Georgia Regiment, was, on June 19th, 1864, admitted to Jackson Hospital, Richmond, Virginia, with a gunshot wound of head. On June 28th the skull was trephined, but death occurred on the following day, June 29th, 1864.

Case.—Private Hugh Gorrigan, Co. A, 39th Illinois Volunteers, aged 37 years, was wounded at Petersburg, Virginia, May 16th, 1864, by a rifle ball, which extensively lacerated the scalp and caused a compound comminuted fracture of the *os frontis*. He was admitted to the Tenth Corps field hospital on the 18th, and sent to the hospital at Hampton, Virginia, on the 19th. On the 22d, Acting Assistant Surgeon H. B. White applied the trephine, and extracted several pieces of the inner plate, which had been driven in upon the brain substance. Patient's general condition was good, though he was somewhat debilitated. On the 24th erysipelas supervened, and death ensued on June 3d, 1864.

Case.—Private Gottlieb Hagelburger, Co. F, 51st Ohio Volunteers, was wounded at the battle of Chickamauga, Georgia, September 19th, 1863, by a musket ball, which struck the right parietal bone, slightly grooving the outer table. He was admitted to the hospital of the 3d division, Twenty-first Corps, and thence conveyed to Hospital No. 8, at Nashville, Tennessee, on the 28th. There was some fever and slight mental disturbance, but no contraction or change in the pupils; the wound was sloughing. Water dressings, frequently repeated, and sulph. mag. were ordered. The symptoms of compression gradually increased, till stertorous breathing set in on the morning of October 2d. The trephine was now applied over the seat of fracture, and all compressing bone removed, giving exit to a small amount of pus. The operation failed to relieve the symptoms, and death ensued on October 4th, 1863. The inner table presented a stellate fracture; several spiculæ of bone had penetrated the dura mater, and were imbedded in the brain substance. The case is reported by Acting Assistant Surgeon L. C. Fonts.

Case.—Private John Heise, Co. B, 26th Illinois Volunteers, received, near Atlanta, Georgia, July 29th to August 15th, 1864, a gunshot fracture of the left parietal bone. He was, on August 15th, admitted to hospital Fifteenth Corps, where, on August 17th, Surgeon D. P. Halderman trephined the skull while the patient was under the influence of chloroform. Death occurred on August 21st, 1864.

Case.—Private William H. Hilborn, Co. K, 86th New York Volunteers, aged 23 years, was wounded at the battle of Mine Run, Virginia, November 27th, 1863, by a conoidal ball, which fractured the angle of the frontal bone, on the left side of the head, and lodged He was admitted to the 1st division, Third Corps, hospital on the same day, and transferred to the 3d division hospital, Alexandria, Virginia, on December 4th. Four days later the skull was trephined, but the patient sank gradually into a comatose condition, and died on the 13th. The autopsy revealed the ball, lying impacted between the hard and soft palates. The case is reported by Acting Assistant Surgeon A. G. Smith.

Case.—Sergeant William N. Irvin, Co. B, 1st battalion, 1st Minnesota Volunteers, aged 25 years, was wounded on June 18th, 1864, near Petersburg, Virginia, by a conoidal ball, which entered the frontal bone, in the immediate vicinity of the left frontal eminence, passed inward, and lodged. He was conveyed to the field hospital of the 2d division, Second Corps, and on June 22d, transferred to the Carver Hospital, Washington. On June 25th, he was placed under the influence of ether, and Surgeon O. A. Judson, U. S. V., removed sequestra, trephined the edge of the fracture, and removed several pieces of cloth and the missile from the interior of the cranium. The fracture was nearly circular, and about one inch in diameter. Considerable swelling existed in the immediate vicinity of the wound, and the left upper eyelid was œdematous. The patient reacted promptly, and appeared to be quite easy; there being no cerebral symptoms or coma. During the day, however, he was attacked with delirium, which continued unabated until June 28th, 1864, when death ensued. The autopsy revealed a compound comminuted fracture of both tables of the *os frontis*, the missile having passed through the membranes of the brain, slightly wounding the left hemisphere of the cerebrum. The brain was completely disorganized; it being a reddish, granular mass. Both lateral ventricles were distended with pink fluid. A coating of lymph was found covering the dura mater at the base of the brain. The case is reported by Surgeon O. A. Judson, U. S. V.

Case.—Corporal John Johnson, Co. G, 8th Iowa Volunteers, aged 20 years, received, at Shiloh, Tennessee, April 6th, 1862, a compound fracture of the skull. He was conveyed to the field hospital, 2d division, Thirteenth Corps, and subsequently transferred to Paducah, Kentucky. The skull was depressed, and the patient suffered from compression of brain and erysipelas. On April 15th the operation of trephining was performed, but death supervened twenty-four hours after the operation.

Case.—Private *A. Kirkpatrick*, Co. H, 44th Tennessee Regiment, received, at the battle of Perryville, Kentucky, October 8th, 1862, a severe gunshot fracture of the cranium, with large depression. He was, on the same day, admitted to the Confederate hospital at Perryville, where the skull was trephined, and several spiculæ of bone were removed. He died on October 30th, 1862. At the *post-mortem* examination, many spiculæ of bone and abscesses below the dura mater were discovered. The case is reported by Surgeon D. W. Yandell, P. A. C. S.

Case.—Private William Lentz, Co. K, 14th Iowa Volunteers, received, at Fort Donelson, Tennessee, February 13th, 1862, a severe gunshot wound of head. He was admitted to regimental hospital, where the operation of trephining was performed. No particulars are reported. He died on March 6th, 1862.

Case.—Captain W. W. Liggett, Co. H, 12th Ohio Volunteers, received, at the battle of South Mountain, Maryland, September 14th, 1862, a gunshot fracture of the top of the arch of the cranium. The dura mater was badly torn by the missile. He was at once admitted to the field hospital at Middletown, where the operation of trephining was performed by Surgeon John McNulty, U. S. V., on the same day. The patient was rational on the morning following the operation, but died on September 21st, 1862.

Case.—Private Charles H. Leonard, Co. H, 57th Massachusetts Volunteers, aged 22 years, was wounded at the battle of the Wilderness, Virginia, May 6th, 1864, by a conoidal ball, which fractured the left parietal bone at its eminence. He was conveyed to Washington, and entered Columbian Hospital on May 11th. The wound was in good condition, the bone being slightly fractured but not depressed, but the patient was nearly comatose and greatly prostrated. On May 15th, Acting Assistant Surgeon H. D. Vosburgh removed portions of the left parietal bone with the trephine, and then took out a fragment of the inner table, which was lying loose on the dura mater. Stimulants and nourishment were freely administered, but the coma became gradually more complete, and the patient died on May 17th, 1864, from cerebritis.

Case.—Corporal Philander D. L———, Co. H, 1st Maine Heavy Artillery, aged 28 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 19th, 1864, by a conoidal ball, which inflicted apparently only a lacerated wound of the scalp, over the superior anterior angle of the left parietal bone.* He was conveyed to Washington, and on the 23d, admitted to the Armory Square Hospital. On examination the external table was found to be fissured and denuded of periosteum. Up to May 30th the patient did not show any symptoms of compression of the brain, but on that day he had a chill. On the 31st, he was placed under the influence of ether. Surgeon D. W. Bliss, U. S. V., then applied the trephine over the seat of injury, and excised a disk one inch in diameter, including only the outer table and diploë. The inner table of the skull was found to be intact, but friable and easily broken. Several pieces of this were removed, as was also a clot which had formed between the inner table and the dura mater. Simple dressings were applied and tonics administered, but pyæmia set in, and death ensued on June 8th, 1864. The specimen is represented in the wood-cut, and consists of a disk and five fragments of bone. The largest fragment is from the inner table, and measures three-fourths by one and one-fourth inches. The disk is one inch in diameter, and includes the outer table and diploë only. The specimen and history were contributed by Surgeon D. W. Bliss, U. S. V.

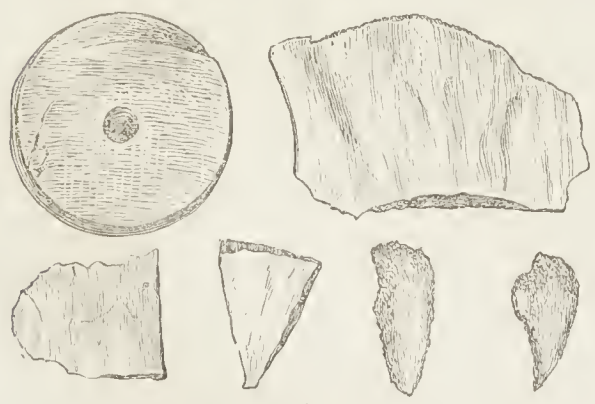

Fig. 138.—Disk and five fragments from left parietal, removed by trephining after gunshot fracture by a musket ball. *Spec.* 2383, Sect. I, A. M. M. [Nat. size.]

* Another report from the Armory Square Hospital states that the inner table was depressed at the anterior superior angle.

CASE.—Private Franklin Lehman, Co. F, 184th Pennsylvania Volunteers, aged 22 years, was wounded before Petersburg, Virginia, October 1st, 1864, by a conoidal musket ball, which fractured the frontal bone. He was at once admitted to the hospital of the 2d division, Second Corps, where the skull was trephined, the ball removed, and cold water dressings were applied. He was conveyed to Washington, and admitted on the 8th into the Campbell Hospital. Death resulted on October 17th, 1864.

CASE.—Private William Lynch, Co. F, 122d Illinois Volunteers, aged 22 years, was wounded near Nashville, Tennessee, December 16th, 1864, by a musket ball, which penetrated the frontal bone. He entered the Cumberland Hospital, Nashville, Tennessee, on the following day, and was on the 18th transferred to Hospital No. 4, New Albany, Indiana. The wound evinced no disposition to heal, small quantities of pus escaping continually from the external opening. The patient became comatose, the pupils contracted, and secretions scant. On January 3d, 1865, Acting Assistant Surgeon John Sloan trephined the skull at the seat of injury. Water dressings were applied to the wound, and stimulants administered. The operation failed to relieve the coma, and the patient died on January 4th, 1865. The autopsy revealed an effusion of pus from the seat of injury to the base of the brain. The case is reported by Acting Assistant Surgeon S. J. Alexander.

CASE.—Private *H. S. McC*——, Co. A, 4th Georgia Regiment, aged 27 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball, which fractured the frontal bone two inches above the internal canthus of the right eye. The internal table was comminuted. He was admitted into Lincoln Hospital, Washington, on the 7th, being rather stupid, but not complaining of pain. These symptoms continued until the evening of the 14th, when he appeared to be in a comatose condition, and began to pass his urine involuntarily. On May 15th, at four o'clock P. M., his skull was trephined, and the depressed portions of the outer and fragments of the inner table were removed, giving exit to a quantity of fluid resembling pus in color and consistency. The comatose condition was relieved by the operation, but death supervened on May 16th. The pathological specimen is No. 1125, Sect. I, A. M. M. The vault of the cranium is trephined just internally to the right frontal eminence. The diameter of the opening is three-fourths of an inch. The specimen and history were contributed by Acting Assistant Surgeon H. M. Dean.

CASE.—Private Hiram McDaniels, Co. D, 149th Pennsylvania Volunteers, was wounded at Spottsylvania, Virginia, May 10th, 1864, by a conoidal ball, which fractured the cranial bones. He was admitted to the field hospital of the 4th division, Fifth Corps, where the operation of trephining was performed. On May 12th, he was sent to general hospital, but probably died on the way, as no further information can be obtained.

CASE.—Private Dominick McCall, Co. E, 65th New York Volunteers, aged 38 years, was wounded at the battle of Winchester, Virginia, October 19th, 1864, by a conoidal ball, which entered near the posterior fontanelle, and emerged about an inch posterior to the foramen magnum. He was on the same day admitted to the hospital of the 1st division, Sixth Corps, where the skull was trephined. On October 23d, he was sent to the Patterson Park Hospital, Baltimore, Maryland. Simple dressings were applied, and nourishing diet administered. He appeared to suffer from compression of the brain, although no bone could be seen or felt pressing on the brain. On the evening of the 25th he became unconscious, and died on October 26th, 1864. The case is reported by Acting Assistant Surgeon M. Kempster.

CASE.—Private Captain *J. K. McIror*, Co. F, 8th South Carolina Regiment, was, on September 17th, 1863, admitted to the hospital at Chester, Pennsylvania, with a gunshot fracture of the frontal bone. On October 4th, he was transferred to the hospital at Point Lookout, Maryland. A resection of the frontal bone was performed, but death from compression of the brain occurred on October 15th, 1863.

CASE.—Private Robert McCormick, Co. E, 29th Pennsylvania Volunteers, aged 23 years, received, at Pilot Knob, Georgia, June 15th, 1864, a gunshot fracture of the *os frontis*. He was conveyed to the field hospital at Chattanooga, and admitted there on June 20th. The skull was trephined, and the pieces of bone were, on June 22d, elevated and removed by Assistant Surgeon C. C. Byrne, U. S. A. Cold water dressings were applied, but the case terminated fatally on June 30th, 1864. The case is reported by the operator.

CASE.—Private Michael Murray, Co. E, 56th Massachusetts Volunteers, received, at the battle of Spottsylvania Court-house, Virginia, May 12th, 1864, a gunshot wound of scalp; ball lodged at vertex of head. He was admitted to hospital of the 1st division, Ninth Corps, and on May 14th sent to Ninth Corps Hospital at Fredericksburg, where the skull was trephined. He died on May 17th, 1864.

CASE.—Private James J. Monaghan, Co. K, 42d New York Volunteers, aged 25 years, was wounded at the battle of Antietam, Maryland, September 17th, 1862; the missile fracturing the left parietal bone about two inches from the sagittal suture. He was conveyed to the Hoffman Hospital, where his skull was trephined. On September 25th, he was transferred to Frederick, Maryland, in a semi-conscious condition; pulse 80, tongue coated, pupils dilated, skin hot and dry; right arm entirely and right leg partially paralyzed; he passed urine and fæces involuntarily. On the following day his condition was the same; saline cathartics were ordered, which operated quite freely, and on September 27th, his pulse was 140 and weaker. He was very restless during the early part of the day; still passed urine and fæces involuntarily; quite unconscious; had a chill at two o'clock P. M., and passed a very restless night; chills recurred on the following morning; pulse 140 and easy; convergent strabismus of right eye. Considerable hæmorrhage occurred from the wound during the morning; later in the day coma supervened; the countenance became almost livid, and the patient died on September 29th, 1863, in a semi-comatose condition.

CASE.—Private A. Nourse, Co. H, 12th Missouri Volunteers, received, near Kenesaw Mountain, Georgia, June 15th, 1864, a gunshot fracture of the cranium. He was at once admitted to the hospital of the 1st division, Fifteenth Corps, where Surgeon A. T. Hudson, 26th Iowa Volunteers, trephined the skull, one hour after the reception of the injury. The patient died on the same day, June 15th, 1864.

Case.—Lieutenant *Wilson B. Newman*, Co. A, 13th Virginia Regiment, aged 25 years, was wounded at the battle of Winchester, Virginia, September 19th, 1864, by a pieee of shell, which fraetured the left parietal bone to one-half its extent. The scalp was extensively lacerated. The patient was at once admitted to the depot field hospital at Winchester, where the trephine was applied by Surgeon A. Atkinson, P. A. C. S. The depressed bone was then elevated and all loose fragments were removed. Cold water dressings were applied to the head, and generous diet ordered. The operation failed to relieve the patient, who had been unconscious since the reception of the injury, and death ensued on September 27th, 1864, from compression of the brain.

Case.—Corporal James B. O'Keafe, Co. C, 68th Pennsylvania Volunteers, aged 36 years, was wounded at the battle of Mine Run, Virginia, November 27th, 1863, by a conoidal ball, which fractured and depressed the left side of the *os frontis* above the outer portion of the superciliary ridge. He was conveyed to Alexandria, Virginia, and admitted into the 3d division hospital, December 5th. Two days later he eomplained of intense pain in the head; his skin was hot and dry, the pulse frequent, and his bowels were constipated. The skull was trephined by Surgeon Edwin Bentley, U. S. V., and spiculæ of bone were removed while the patient was under the influence of ether. Simple dressings were applied to the wound, eathartics administered, and low diet ordered. Extensive suppuration supervened, and death followed on the 13th, from inflammation of the brain and its membranes. At the autopsy, the membranes of the brain were found infiltrated with pus. Coagulable lymph and serum existed in the eavity of the arachnoid, and the brain was softened and congested. Acting Assistant Surgeon W. G. Elliott reports the case.

Case.—Adolph Oehme, Musician, Co. I, 32d Indiana Volunteers, was wounded at Liberty Gap, Tennessee, June 26th, 1863, by a conoidal musket ball, which fractured and depressed the left parietal bone at its inferior and external angle, injuring the brain substance. He was admitted into the field hospital at Murfreesboro', Tennessee, on the same day, being conscious, though dull and unsteady in his gait. Surgeon I. Moses, U. S. V., trephined the skull, removed all loose fragments, and elevated others. The external table was fractured and depressed one square inch; the depression of the inner table was more extensive. He rallied well from the operation, and the symptoms were apparently favorable until July 3d, when coma, and, shortly afterward, death, supervened. The case is reported by the operator.

Case.—Private David Platner, Co. C, 39th New York Volunteers, was wounded at the battle of Cold Harbor, Virginia, June 1st, 1864, by a conoidal ball, which fractured the cranium. He was on the same day admitted to hospital of the 1st division, Second Corps, where Surgeon P. E. Hubon, 28th Massachusetts Volunteers, trephined the skull. The result is not known, but the patient probably died.

Case.—Private John Quinlin, Co. H, 2d Illinois Cavalry, aged 28 years, received, on April 8th, 1864, at Pleasant Hill, Louisiana, a gunshot fracture of both tables of the anterior portion of the left parietal bone. He was admitted into the field hospital of the cavalry division, and thence conveyed to New Orleans, Louisiana, and admitted into the Marine Hospital on April 14th. The following morning he complained of headache, which gradually increased, and the face was in an erysipelatous condition. On the morning of the 20th, vomiting set in, and in the afternoon coma supervened. On April 21st, Surgeon Jacob Bockee, U. S. V., performed the operation of trephining, in order to relieve symptoms of compression supposed to have been caused by an accumulation of pus on the brain, or perhaps by depression of the internal table. The bone was found denuded of periosteum to the extent of three-quarters of an inch in width by two and a half inches in length. Pus to the extent of half an ounce was found in the diploic structure; also on the surface of the brain. The patient was comatose, but sensible to the pain of the operation, which failed to relieve the symptoms. He was delirious and noisy during the following night; then became quiet, and continued so until the 23d, when death supervened from inflammation and suppuration of the brain and its membranes. The case is reported by the operator, Surgeon J. Bockee, U. S. V.

Case.—Private Philip R———, Co. I, 10th New York Volunteers, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a gunshot missile, which fractured and depressed the left parietal bone, just below the tuberosity. He was admitted into the Ascension Church Hospital, Washington, on the 17th, partially insensible, but answering when spoken to sharply. The pupils were nearly normal, pulse 72, and gradually becoming slower and more suggestive of approaching eoma. On the 19th, the patient was placed under the influence of chloroform, and Surgeon J. H. Brinton, U. S. V., assisted by Surgeon J. C. Dorr, U. S. V., and Dr. Brodie of Edinborough, performed the operation of trephining. The depressed fragments were elevated and removed, causing considerable hæmorrhage, which gradually ceased after the operation. At seven o'cloek P. M., the pulse was 66, thready and sharp; patient semi-conscious and complaining of cold. The next morning the pupils were nearly normal; pulse 78; breathing natural, but bowels not open. There was considerable hæmorrhage at noon, which was readily checked. Afterward, coma gradually supervened, the pupils became dilated and insensible to light, and involuntary urinations occurred. He continued to sink rapidly, and died on the morning of December 22d, 1862, in a state of complete coma. The pathological specimens are Nos. 528, 965, and 966. The former shows a section of the vault of cranium, with one disk and seven fragments from the left parietal bone. The two latter are wet preparations of the dura mater and the left cerebral hemisphere containing an abscess. The specimens were contributed by Surgeon J. C. Dorr, U. S. V.

Case.—Private William G. Risher, Co. E, 139th Pennsylvania Volunteers, aged 22 years, was wounded in the defences of Washington, July 12th, 1864, by a conoidal ball, which fractured the frontal bone three-fourths of an inch to the right of the median line and half an inch anterior to the coronal suture, and lodged. He was admitted to Campbell Hospital on the 13th in a comatose condition, and on the same day Acting Assistant Surgeon E. A. Kemp applied the trephine, and removed the ball and fragments of bone which had been driven two inches into the brain substance. Ice was applied to the head, purgatives administered, and abstinence from food rigidly enforced. Death supervened on July 15th, 1864. The case is reported by Surgeon J. H. Baxter, U. S. V.

CASE.—Sergeant Willard Robeck, Co. G, 5th Iowa Cavalry, was treated in the regimental hospital near Fort Donelson, Tennessee, for injury and compression of the brain. When and where the injury was received cannot be definitely ascertained, but the operation of trephining was performed. Death occurred April 24th, 1863.

CASE.—Private *L. Schumpert*, Co. F, 20th South Carolina. Shell fracture of the left temporal bone July 18th, 1863. Trephining August 10th. Death, August 11th, 1863. Autopsy.*

CASE.—Corporal Charles Stotter, Co. C, 11th Kansas Volunteers, received, at the battle of Prairie Grove, Arkansas, December 7th, 1862, a gunshot wound of the head, with fracture of the posterior portion of the right parietal bone. He was admitted into the regimental hospital on the following day, where trephining was resorted to. Fungous excrescences formed upon the brain a few days later, and were removed by caustic applications. About the twelfth day after the operation, an abscess was developed in the cerebral substance, and death resulted therefrom December 27th, 1862. The case is reported by Surgeon George W. Hogeboom, 11th Kansas Volunteers.

CASE.—Private John Sperber, Co. A, 66th New York Volunteers, aged 43 years, was wounded at the battle of Antietam, Maryland, September 17th, 1862, by a conoidal musket ball, which fractured and depressed the cranium at the junction of the occipital and parietal bones, driving fragments into the brain substance. He was admitted to the field hospital, and cold water dressings were applied. Convulsions and insensibility ensued, whereupon Surgeon C. S. Wood trephined and elevated the depressed portion, removing all detached fragments of bone. The lodgement of the missile was not ascertained. Consciousness was restored by the operation, but convulsions recurred, and the patient died on September 23d, 1862. The case is reported by the operator, Surgeon C. S. Wood, 66th New York Volunteers.

CASE.—Private G. W. Summers, Co. F, 11th New Hampshire Volunteers, was wounded near Petersburg, Virginia, July 22d, 1864, by a shell, which fractured the cranium. He was immediately conveyed to the field hospital of the 2d division, Ninth Corps, where the operation of trephining was performed. He was thence sent to Washington, but death supervened on the 30th while on the way. The case is reported by Surgeon Theodore S. Christ, 45th Pennsylvania Volunteers.

CASE.—Sergeant Eugene B. Stinson, Co. F, 12th Maine Volunteers, aged 28 years, was wounded at Winchester, Virginia, September 19th, 1864, by a conoidal ball, which fractured the frontal bone, about half an inch to the left of the median line, and two inches below the coronal suture. He was admitted to the hospital of the 1st division, Nineteenth Corps, on the same day; on September 22d sent to the depot field hospital at Winchester, and on the 25th transferred, via Sandy Hook, Maryland, to the Mower Hospital, Philadelphia. In the course of ten days after admission, premonitory head symptoms of a violent and unmistakable character exhibited themselves, and the patient became rapidly comatose. On October 12th he was chloroformed. Acting Assistant Surgeon W. P. Moon then made a crucial incision through the integument, trephined the frontal bone at the margin of fracture, to the left of the median line, and one inch below the coronal suture, elevated the depressed bone, and removed a section of the outer, and seven spiculæ of the inner table. The internal table was fractured and driven down upon the membranes, while the outer table was only slightly indented, neither fissure nor fracture being perceptible. The patient reacted promptly, and continued to improve for three days. The pulse became fuller and more regular, the coma lessened, and the cerebral symptoms subsided. On the fourth day he had a chill, complained of pain in the epigastric region, and his respiration became hurried. The next day he began to sink rapidly, coma returned, and death followed on October 18th, 1864. A *post-mortem* examination revealed an abscess in the left hemisphere, at the point of injury. The membranes were much congested. The case is reported by Acting Assistant Surgeon W. P. Moon.

CASE.—Private *H. L. Smith*, Co. B, 1st Arkansas Regiment, received, at the battle of Shiloh, Tennessee, April 6th, 1862, a fracture of the occipital bone. He was, on April 17th, admitted into Hospital No. 6, Louisville, Kentucky, the wound being in a bad condition. On the 22d chloroform was administered, and Assistant Surgeon Benjamin Howard, U. S. A., applied the trephine, and removed some loose bone. Partial coma supervened and continued until death, which occurred on April 25th, 1862.

CASE.—Lieutenant William D. Sprouse, Co. B, 40th Illinois Volunteers, was wounded near Atlanta, Georgia, August 15th, 1864, by a conoidal ball, which fractured the left parietal. He was at once admitted to hospital 4th division, Fifteenth Corps, where, six hours after the reception of injury, Assistant Surgeon William Graham, 40th Illinois Volunteers, trephined the skull; the patient being under the influence of chloroform. He was on the same day sent to the hospital of the Fifteenth Corps, at Marietta, and died on August 23d, 1864.

CASE.—Private *Isaac Souls*, Co. H, 23d South Carolina Regiment, aged 19 years, received, on August 30th, 1862, a gunshot fracture of the frontal bone, near the anterior fontanelle, and directly on the median line. He was admitted into the Confederate hospital at Charlottesville, Virginia, and on September 5th, the trephine was applied to the right of the median line, to avoid the longitudinal sinus. Owing to the existence of a lateral deviation, the sinus was exposed upon removing the disc of bone, but not injured. One week after the operation, severe chills set in, followed by fever; then double pneumonia made its appearance, with symptoms of pyæmia, and sixteen or seventeen days after the operation, the patient died suddenly during a fit of coughing, from rupture of the longitudinal sinus, and profuse hæmorrhage. A *post-mortem* examination revealed ulceration of the coats of the sinus, with small spiculæ of bone resting upon it. The case is reported by Assistant Surgeon B. W. Allen, P. A. C. S.

CASE.—Private William Thompson, Co. E, 12th Illinois Infantry, was wounded at Allatoona, Georgia, October 5th, 1864, by a conoidal ball, which fractured the external table of the right parietal bone. He was on the same day admitted to the hospital of the 4th division, Fifteenth Corps, and on the 9th sent to the general hospital at Rome, Georgia. On the 14th, violent convulsions occurred; the patient was placed under the influence of chloroform and ether, when Surgeon J. H. Grove, U. S. V., applied the trephine, and removed fragments of necrosed bone, giving exit to a quantity of pus which had formed beneath the bone. Consciousness returned, and the convulsions subsided soon after the operation, but returned on the following day; coma supervened, and death occurred on October 16th, 1864.

* For a full history of this case, see the Manual of Military Surgery, page 296, by Dr. J. J. Chisholm. 1864.

CASE.—Joseph A. Tracey, Musician, Co. H, 18th Connecticut Volunteers, aged 20 years, was wounded at Snicker's Ferry, Virginia, July 20th, 1864, by a conoidal ball, which fractured the right parietal bone. He was conveyed to Sandy Hook, Maryland, and admitted into the hospital on the 22d. On the following day Assistant Surgeon James Willard, 1st Potomac Home Brigade, applied the trephine and elevated the depressed portion. The meninges were found lacerated. Simple dressings were applied, but death ensued on August 7th, 1864.

CASE.—Private Julius Theobald, Co. D, 32d Indiana Volunteers, was wounded at Shiloh, Tennessee, April 6th, 1862, by a fragment of shell, which fractured and depressed the cranium. He was admitted to the General Hospital, No. 3, Evansville, Indiana, on the 12th, where, on the following day, his skull was trephined. He was removed by his friends to a private house, and died on the 3d of May, 1862. The case is reported by Surgeon Daniel Morgan, U. S. V.

CASE.—Private *W. A. Tatum*, Co. B, 12th Tennessee Regiment, aged 25 years, was wounded near Atlanta, Georgia, May 17th, 1864, by a conoidal ball, which struck the upper edge of the right parietal bone, causing depression of both tables of the skull. One hour after the reception of the injury, the trephine was applied, and all spiculæ of bone were removed. He was admitted, on the following day, to the Institute Hospital at Atlanta. He was fully conscious, free from all pain, and able to walk about the ward. On May 20th, the pulse was 70, and he complained of slight headache, which had increased by the 23d. On the following day there was no pain, and the patient was apparently doing well. From this time he grew dull, lost his appetite, became totally unconscious; on May 28th, brain substance began to slough, and death occurred on June 1, 1864. The case is reported by Surgeon D. C. O'Keefe, P. A. C. S.

CASE.—Private *X*———, a Confederate soldier, was wounded at Fort Donelson, Tennessee, February 16th, 1862, by a musket ball, which entered the occipital bone one inch to the left of the occipital protuberance, passed between the tables, comminuting and depressing the internal, and made its exit one and a half inches to the right of the same protuberance, without fissuring the external table. Two days later he was admitted to the Academy Hospital, Nashville. He seemed drowsy and dull, but was not comatose, nor did paralysis exist. He was placed under the influence of chloroform and ether, the scalp was dissected from the wound, and the bridge of bone between wounds of entrance and exit was removed. The trephine was then applied to the angles of the wound, and fragments of the inner table were removed, laying bare the sinuses and the torcular Herophili, without injury to the meninges, and leaving an opening between the bony margins of the wound of sufficient size to admit two fingers placed side by side. The dura mater was uninjured. The flaps were brought together by silken sutures. Cold water dressings were applied, and the bowels freely evacuated. Tincture of iron was given to control the circulation. The patient continued perfectly conscious; his mental faculties retained their accustomed activity, and he was soon able to sit up. The sutures had come away, the wound of scalp had nearly healed, and his general condition seemed very promising, when, on the tenth day after the operation, erysipelas manifested itself on the nose, and extended rapidly over the face and neck to the lips of the wound. Delirium set in on the twelfth day, and death supervened two days subsequently, March 4th, 1862. The case is reported by Surgeon Eben Swift, U. S. A.

CASE.—Private Ezra O. White, Co. D, 4th Wisconsin Volunteers, received, in the engagement at Port Hudson, Louisiana, June 14th, 1863, a gunshot wound of the cranium, involving the brain He was on June 16th admitted to St. Louis Hospital, New Orleans, Louisiana, where, on June 18th, the operation of trephining was performed. No relief was afforded, and death occurred on July 3d, 1863. Surgeon F. Bacon, U. S. V., reported the case.

CASE.—Private P. C. Walker, Co. E, 4th Delaware Volunteers, aged 24 years, was wounded at Ream's Station, Virginia, August 19th, 1864, by a shell, which fractured the skull near the junction of coronal with the sagittal suture. He was on the same day admitted to the hospital of the 4th division, Fifth Corps, and thence conveyed to Philadelphia, and admitted to the Mower Hospital August 29th. The wound was in a healthy condition, but the face was swollen and œdematous, with symptoms of erysipelas. The patient's general health was good, and there were scarcely any symptoms of compression. On September 9th, Acting Assistant Surgeon W. P. Moon placed the patient under the influence of chloroform, made a semi-lunar incision through the integument, and trephined the skull. A large abscess had formed between the membranes of the brain and the cranium. Death from meningitis supervened on September 18th, 1864, nine days after the operation. The case is reported by Surgeon J. Hopkinson, U. S. V.

CASE.—Sergeant Lafayette Young, 2d Co. of Sharpshooters attached to the 27th Michigan Volunteers, aged 27 years, was wounded at the battle of the Wilderness, Virginia, May 5th, 1864, by a conoidal musket ball, which fractured the skull at the sagittal suture. He was conveyed to Washington, and on the 25th admitted to the Harewood Hospital. The man's mind was sound, although strabismus of the left eye indicated symptoms of compression of the brain. The left leg was partially paralyzed. On May 28th, he was placed under the influence of ether, and Surgeon R. B. Bontecou, U. S. V., applied the trephine to the left edge of the wound, removed the loose bone, and elevated the depressed portions. The patient improved under antiphlogistic treatment, and on June 1st healthy suppuration supervened. Two weeks later, the left leg became entirely free from paralysis. On July 1st, small pieces of bone were removed, and the wound looked unfavorable. On the 23d, Young was transferred to the St. Mary's Hospital, Detroit, Michigan, affected with strabismus of the left eye and paralysis of the left leg. He was furloughed on August 2d, but died before the expiration of his leave of absence, August 21st, 1864.

CASE.—Private Albert D. Nelson, Co. D, 12th New Hampshire Volunteers, was wounded at Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball, which fractured and depressed the squamous portion of temporal bone, laying the scalp open some three inches, and glanced off. The trephine was at once applied by Surgeon C. S. Wood, 66th New York Volunteers, and the lower fragments were removed, the depressed portions elevated, and water dressings applied. He was then conveyed to hospital of the 1st division, Third Corps, and on May 6th sent to Lincoln Hospital, Washington. On May 25th, he was transferred to Fort Wood, New York Harbor, and on June 3d to McDougall Hospital, Fort Schuyler, whence he deserted July 20th, 1863. Promoted corporal February 5th, 1864. Died, of disease, at Bristol, New Hampshire, February 10th, 1865.

The following cases of trephining for gunshot fracture resulted in recovery, the patients presenting various degrees of disability:

CASE.—Corporal J. A. B———, Co. C, 2d New Hampshire Volunteers, aged 21 years, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a fragment of shell, which fractured and depressed the upper portion of the occipital bone to the extent of two inches square. He was admitted into the Satterlee Hospital, Philadelphia, on the 10th, very much debilitated, and complaining of pain over his eyes. His mental faculties were somewhat sluggish, but not to any marked degree. A fragment of bone had come away leaving the brain exposed. The trephine was applied and the largest piece of depressed bone removed. On January 9th, 1864, another portion of the occipital bone of an oval shape, two inches in its long diameter, and including both tables, was removed by Acting Assistant Surgeon L. K. Baldwin. He had some inflammation of the brain and erysipelas, but recovered under ordinary treatment. On March 1st, 1864, he was transferred to DeCamp Hospital, David's Island, New York Harbor, where he remained until June 7th, 1864, when he was discharged from the service by reason of vertigo and constant pain in the head. The pathological specimen, No. 430, consists of a necrosed fragment of the occipital bone and was contributed by Acting Assistant Surgeon L. K. Baldwin. A communication from the Commissioner of Pensions dated January 2d, 1868, states that Barker is a pensioner, and that his disability is rated as total and permanent. The case is reported by Acting Assistant Surgeon T. G. Morton.

CASE.—Lieutenant Samuel H. Berry, Co. D, 82d Ohio Volunteers, was wounded in an engagement at Bull Pasture Mountain, Virginia, May 8th, 1862, by a conoidal ball, which passed under the scalp for about two inches on the surface of the left parietal bone and emerged. There was no depression and but a slight fracture of the outer table. After the first shock there were no apparent brain symptoms until the fifth day, when pain in the locality of the wound and mental aberration supervened. They did not yield to treatment, and the third day following found the patient in a state of coma. As a last resort it was determined to trephine, which was done on the ninth day after the injury by Surgeon S. Y. Cantwell, 82d Ohio Volunteers. The internal table was now found to be extensively fractured, and thirteen spiculæ of bone were removed, one piece having pierced the membranes and penetrated the substance of the brain. After the operation there was a marked improvement in the symptoms, notwithstanding the patient was afterward attacked by erysipelatous inflammation of the scalp and face; he gradually and finally recovered, and was discharged from the service on August 19th, 1862. The case is reported by the operator,

CASE.—Private David B———, Co. E, 100th Pennsylvania Volunteers, aged 33 years, was wounded at Petersburg, Virginia, June 17th, 1864, by a conoidal ball, which fractured the left parietal bone at the central portion and superior border of the temporal ridge. He was admitted on the same day to the field hospital of the Ninth Corps, and thence conveyed to Washington, and admitted to the Harewood Hospital on the 2d of July. On the 17th, he was sent to the Mower Hospital, Philadelphia. On admittance, the wound appeared to be only one of the scalp. Cold water dressings were applied; calomel, tonics, anodynes, and light diet ordered, and the patient placed in a recumbent position, with the head elevated. On July 20th, he evinced a want of comprehension when addressed, and hesitated in replying. From that date there was a growing tendency to coma, and on the 29th he was completely unconscious. His pupils were dilated, respiration was labored, and pulse slow and soft. On the 30th, ether was administered, and Acting Assistant Surgeon D. H. Agnew applied the trephine and removed a section of the outer and four small fragments of the inner table, involving one-third of a square inch of surface. A small abscess was found forming outside of the membranes. Immediately after the operation, consciousness and intelligence returned. By the 1st of August the wound had commenced to granulate; the patient was cheerful and his appetite improving. In two weeks he was able to go about the ward, though suffering from pain in the head upon exposure to the sun. He was discharged from service on September 22d, 1864. The pathological specimen is No. 3626, Sect. I, A. M. M., and consists of four small fragments of the parietal bone, chiefly from the inner table. The specimen and history were contributed by Surgeon J. Hopkinson, U. S. V.

CASE.—Private Lawrence Coffield, Co. E, 34th Illinois Volunteers, aged 30 years, was wounded at the battle of Murfreesboro, Tennessee, January 1, 1863, by a conoidal ball, which struck the right temple; he also received a wound of the left thigh. He was on January 5th admitted to Hospital No. 19, Nashville, Tennessee; on January 10th sent to Hospital No. 10, Louisville, Kentucky, and on January 27th to Camp Dennison, Ohio. No treatment is recorded. He was discharged from the service on August 14th, 1863, but reënlisted in Co. H, 123d Indiana Volunteers, on February 24th, 1864. He served with the latter regiment until August 6th, 1864, when he was wounded near Atlanta, Georgia. The missile entered near the occipital protuberance, passed to the bone, and then into the neck, making its exit near the ear. He was admitted to the field hospital of the Twenty-third Corps; on September 20th sent to Hospital No. 19, Nashville, Tennessee; on October 19th to the Brown Hospital, Louisville, Kentucky, and on December 19th to the Main Street Hospital, Covington, Kentucky. The occipital bone was necrosed. The patient's health was good, but the muscles of the face and tongue were partially paralyzed. On examination, a fistula was found on the right side of the head, just above the arch of the malar bone, into which a probe could be passed one and a half inches, to the skull. A ball was found imbedded at the base of the petrous portion of the temporal bone; the rim (base) of the missile lying just inside of the skull. A sinus extended along the track of the missile. The ball had been there since the battle of Murfreesboro', Tennessee, January 1, 1863. On February 24, 1865, an incision was made by Surgeon Norman Gay, U. S. V., the trephine applied to enlarge the opening, and the ball removed. Coffield recovered as fast as could be expected; was on June 10th sent to Camp Dennison, Ohio, and on July 5, 1865, mustered out of the service. The case is reported by the operator, Surgeon Norman Gay, U. S. V. This soldier's name is not on the Pension List.

CASE.—Private John F. D———, Co. E, 178th New York Volunteers, aged 37 years, was accidentally wounded on July 12th, 1863, by a conoidal ball, which struck the parietal bone half an inch posteriorly to the coronal, and one inch to the left of the sagittal sutures, passing backward, and emerging about four inches from the point of entrance. He was admitted into Armory Square Hospital, Washington, the next day, in a somewhat stupid and restless condition, with anxious countenance.

Partial paralysis of arm, and paralysis agitans of forearm of the opposite side existed. An examination of the wound revealed depression of a small portion of the external plate, one-half inch in length by one quarter of an inch in width. A fissure extended one inch and three-fourths posteriorly from the depressed portion of the bone. The fracture of both tables could be readily recognized by the pulsating motion of the fluid which had accumulated in the cavity. Surgeon D. W. Bliss, U. S. V., applied the trephine over the depressed portion. Great difficulty was experienced from the detached portions of the inner table moving under the trephine. These fragments were removed by means of forceps. The dura mater was abraded at several points, but not torn through. After the operation, the wound was carefully cleansed, water dressings were applied, the patient placed in a semi-recumbent position, and quiet enjoined. A gradual improvement took place, and by July 29th the case presented all indications of a speedy recovery. Paralysis steadily diminished. He was sent to the DeCamp Hospital, New York Harbor, October 29th, 1863, and transferred to the Veteran Reserve Corps, March 3d, 1865. The specimen is figured in the wood-cut, and shows a disk and five fragments of bone. One and a half square inches of the internal table were removed. The specimen and history were contributed by Surgeon D. W. Bliss, U. S. V.

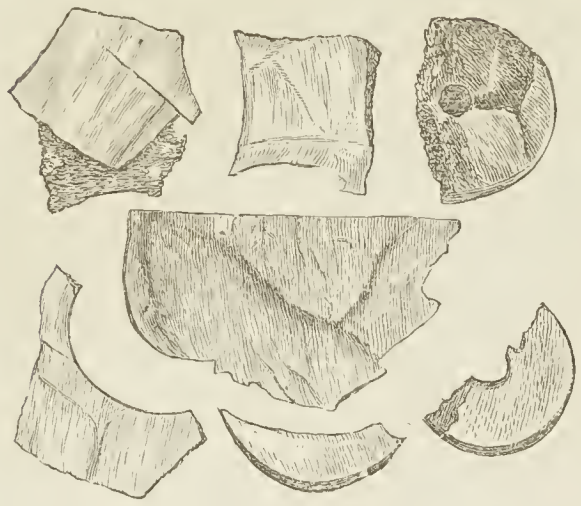

FIG. 139.—Disk and fragments removed for gunshot fracture of the parietal bone. *Spec.* 1474, Sect. I, A. M. M.

CASE.—Private John E———, Co. C, 39th New York Volunteers, aged 35 years, was wounded in a melee in a railroad car, near Chicago, Illinois, November 16th, 1862, by a pistol ball, which caused a compound fracture of both tables of the *os frontis*, right side, near the border of the temporal bone. He arrived at Washington on the 26th, and was admitted to Armory Square Hospital, being quite delirious. There was much tumefaction, and extensive suppuration had already commenced. His strength, appetite, and secretions were normal, his pulse slightly accelerated and tense. An examination revealed a wound of the scalp, two inches in length, crossing the coronal suture at right angles, two inches above the border of the temporal bone. On the morning after admission, the delirium was so intense that it was impossible to keep the patient in the ward. There was occasional difficulty in articulation and a tripping of the left foot in walking, denoting slight hemiplegia. The memory was somewhat impaired, but lucid intervals occurred. The constitutional symptoms had remained the same, denoting irritation rather than compression of the brain. On the 22d, the tumefaction having somewhat subsided, a further examination revealed another wound of the scalp, one and a half inches below the first, and a ball imbedded in the cranium. Ether was administered and an incision made through the integument. The trephine was then applied, and the portion of the cranium containing the ball was removed, as also a fragment of the inner table, triangular in shape, three-eighths of an inch in length and one-fourth of an inch in width at the base. The latter was found driven into the substance of the brain, piercing the dura mater and standing point downward, its broad base displacing the meningea media. After the operation the patient rose from the table, perfectly sane, and walked to his bed. Cold water dressings were applied, laxatives administered, and low diet ordered, and by the 25th he was improving rapidly, there having been no delirium since the operation. On December 10th, the general health of the patient was good, and the wound across the coronal suture had nearly closed by healthy granulations. The wound of operation had healed by first intention, except at the place where the flaps met; at that point there was healthy granulation going on. On January 6th, 1863, he was discharged from the service, having entirely recovered. The specimen removed is a disk of bone, one-half an inch in diameter, with fracture and depression of both tables, and was contributed by Surgeon D. W. Bliss, U. S. V. It is figured in the wood-cut.

FIG. 140.—Disk with a depressed gunshot fracture in its centre.—*Spec.* 422, Sect. I, A. M. M.

CASE.—Private Charles M. E———, Co. H, 17th Pennsylvania Cavalry, aged 21 years, was wounded at Shepherdstown, Virginia, August 25th, 1864, by a musket ball, which entered the right parietal bone near the sagittal suture and emerged at the posterior superior angle of the left parietal bone, producing a compound comminuted fracture. The ball in its passage carried away a piece of the external table one and a half inches in length, and half an inch in width, and depressed the inner table. He was taken to Sandy Hook, Maryland, and thence conveyed to Annapolis Junction on August 27th. Complete paralysis of the right and partial of the left leg existed. Patient was debilitated and anæmic; had lost considerable blood, and was much depressed, physically and mentally. Acting Assistant Surgeon Streeter applied the trephine to the external table and removed fragments of the fractured and depressed inner table, leaving the brain pulsations distinctly visible. The soft parts were then brought together with adhesive strips, and cold water dressings applied, lint and dry oakum being substituted, when the wound began to suppurate. The pulse daily increased in frequency and strength until it reached 72, and the patient regained the use of his limbs sufficiently to walk with a cane. On October 10th, he was transferred to Haddington Hospital, Philadelphia, the wound closing with healthy granulations and bidding fair to heal rapidly. He was transferred to the Veteran Reserve Corps on March 2d, 1865, and discharged June 28th, 1865. The pathological specimen is No. 3600, Sect. I, A. M. M., and consists of a disc and six fragments of diploë and vitreous table removed by the trephine from the left parietal bone. The case is reported by Acting Assistant Surgeon H. S. Streeter. On March 19th, 1866, Pension Examiner J. G. Koehler reports that the patient suffers from partial paralysis of the left side of the body. He rates his disability one-half and temporary.

CASE.—Private Samuel G———, Co. C, 183d Pennsylvania Volunteers, aged 17 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 12th, 1864, by a conoidal ball, which depressed the right parietal bone at its posterior superior angle. A spicula, one and one-fourth inches in length and three-fourths of an inch in breadth, was driven in upon the dura mater. He was admitted to the hospital of the 1st division, Second Corps, and on the 23d sent to the Armory Square Hospital, Washington. Slight paralysis of the left leg and hand existed. The pupils were normal, but the tongue protruded. There were also slight symptoms of compression. On the following day, the patient was placed under chloroform, and Surgeon

D. W. Bliss, U. S. V., trephined the skull and removed twelve pieces of bone. The dura mater was ruptured, and the pulsations of the brain were distinctly visible. Simple dressings were applied, and on May 29th the patient was doing well. On July 17th, he was transferred to Philadelphia and admitted into the Mower Hospital, where he remained until January 28th, 1865, when he was transferred to the Veteran Reserve Corps. The pathological specimen is No. 2375, Sect. I, A. M. M., and consists of a disc and three small fragments of bone. The specimen and history were contributed by Surgeon D. W. Bliss, U. S. V. The man was discharged on November 20th, 1865, and pensioned. On April 10th, 1867, Pension Examiner Thomas B. Reeve reported that there was a large depression at the seat of injury which was very sensitive. The patient said that he lost seventeen pieces of bone and could not bear the heat of the sun, and suffered from headache, dizziness, impaired memory, and defective eyesight, and was gradually growing worse.

Case.—Private *E. Herring*, Co. E, 38th Georgia Regiment, was wounded at the battle of Antietam, Maryland, September 17th, 1862, by a conoidal ball, which struck in the middle of the right parietal bone, carrying away a considerable portion of both tables. The wound was hurriedly dressed upon the field, after which he was sent to hospital, where his wound soon closed without having undergone any further examination for spiculæ or depressed portions of bone. Soon after the wound had healed, he was attacked with epileptic fits, which continued at uncertain intervals until the 18th of May, 1864, when he was again admitted to a Confederate hospital. Upon examination of the cicatrix, a very marked depression was found, and an elastic, yielding sense of touch beneath it. The epilepsy continuing, and the attacks becoming more frequent, it was decided to operate. Acting Assistant Surgeon R. R. Ritchie, P. A. C. S., administered chloroform and made a T incision, the first part lying parallel with the sagittal suture, and the second striking it at about its upper third, over the cicatrix and above the point of fluctuation. The scalp was found adhering to the skull, and abnormal in structure and thickness. The opening through the inner and outer table was covered with a firm cartilaginous layer, on removing which considerable hæmorrhage from within took place, which was, however, promptly controlled by the application of a heated needle to the orifice of the vessel. The trephine was first applied above the opening toward the corono-sagittal suture; after the removal of which portion, it being evident that the depression extended farther, and the loss of substance around the open skull, near the point of fluctuation, precluding the idea of elevating the depressed bone, the trephine was again applied, posteriorly, and somewhat beneath the first place, at about one inch distance, and the bone having been removed, the edges of the skull between the first and second openings, and between either and the point where both tables had been destroyed by the missile, were taken away by means of Hey's saw, leaving a truncated opening of about half an inch square. Immediately beneath this was disclosed a decided convexity and fluctuation, combined with a peculiar discoloration of the dura mater. This membrane was carefully divided, revealing the ball resting, point downward, on the brain, and giving exit to about four ounces of a yellowish serous fluid. All pressure being removed, and the flow of blood arrested, the wound was closed by interrupted sutures, and cold water dressings applied. Patient reacted well from the effects of the chloroform, and did unusually well until the morning of the fifth day, when he had another convulsion, which was attributed to the accidental disturbance of the bandage, and did not recur. The wound healed by first intention, and there was every probability of a complete recovery. The case is reported by Surgeon B. Roemer, P. A. C. S.

Case.—Private Charles L———, Co. B, 55th New York Volunteers, aged 30 years, was wounded at the battle of Malvern Hill, Virginia, July 1st, 1862, by a conoidal ball, which struck the right frontal bone about an inch above the right superciliary ridge, and lodged. He was conveyed to Washington, and admitted into the Judiciary Square Hospital on the 4th. On the 10th, he complained of constant headache and nausea; the right eye was injected, but the tongue, pulse, and bowels were normal. A portion of the frontal bone was depressed, and the pulsations of the brain could be seen fluctuating up and down the fissures of the fracture. It being feared that the depressed portions might irritate the dura mater and give rise to inflammation, and in view also of the constant headache, the skull was trephined on the 11th by Acting Assistant Surgeon David W. Cheever, and two large pieces and some splinters of depressed bone were removed. At one point the dura mater had a depression as if made by the passage of the ball; otherwise it looked uninflamed and healthy, but there was some effusion of blood. Water dressings and low diet were ordered. On the second day after the operation, pain was felt as the head was moved about, but no fever existed. There was considerable discharge of laudable pus. The brain was still seen pulsating on the 15th, but not so plainly as before. On the 20th, his condition was every way favorable; the pulse quiet, tongue clean, skin cool, appetite good, no pain in head, the wound closing, and granulations seen over the dura mater. He recovered, and was discharged from the service January 4th, 1863. A communication from the Commissioner of Pensions, dated January 2d, 1868, states that Lawrence is a pensioner, and that his disability is rated at one-half and temporary. The pathological specimen is No. 261, Sect. I, A. M. M. The disk and fragments of cranium removed by the trephine embrace one-fourth square inch in surface. The specimen and history were contributed by Acting Assistant Surgeon D. W. Cheever. Pension Examiner P. Stewart, of Peekskill, reports that the patient suffers from giddiness and vertigo.

Case.—Private G. W. McIntosh, Co. H, 40th Indiana Volunteers, aged 31 years, was wounded at the battle of Dallas, Georgia, June 4th, 1864, by a conoidal musket ball, which fractured the frontal bone just above the left eminence. He was on the same day admitted to the hospital of the 2d division, Fourth Corps; thence transferred to the Cumberland Hospital, Nashville; and on the 29th sent to the Totten Hospital, Louisville, Kentucky. His constitutional condition was excellent. Only simple dressings were applied to the wound, but small pieces of bone were discharged from time to time. The patient complained of dizziness and headache, and was strongly impressed with the idea that the ball remained in the wound, of which there seemed every probability. On August 17th, Acting Assistant Surgeon D. J. Griffith administered chloroform, trephined the skull, and removed two buttons of bone, but failed to find the ball. The wound healed, and McIntosh was furloughed on September 19th, 1865, and mustered out of service on December 21st, 1865, still suffering from headache and dizziness, especially after being exposed to the heat of the sun. A communication from the Commissioner of Pensions, dated March 26th, 1868, states that Private McIntosh is a pensioner at $15 per month, and that his disability is rated total and permanent. The report of Examining Surgeon M. Herndon, of Montgomery County, Indiana, states that the ball cannot be extracted without injuring the membranes of the brain, in the opinion of the best surgeons of the country.

Case.—Private John McK———, Co. H, 105th Pennsylvania Volunteers, was wounded at Petersburg, Virginia, June 14th 1864, by a conoidal musket ball, which struck the right side of the skull very obliquely, and produced a slightly depressed fracture of the right parietal bone. He was admitted to Mount Pleasant General Hospital, Washington, on June 24th, with the report that the progress of the case had been so far eminently satisfactory. After admission, he was found to be insensible, and a few hours subsequently, convulsions supervened in rapidly recurring paroxysms. Twelve ounces of blood were taken from the temporal artery without apparent benefit. A trephine was then applied to the seat of fracture, and, upon the removal of a button of bone, a portion of the inner table was found slightly depressed. This was elevated, and the patient soon afterward regained consciousness. On June 28th, the wound in the scalp became erysipelatous, and before the inflammation subsided, there was extensive loss of substance of the integuments and pericranium, denuding a large portion of the parietal bone. Necrosis ensued, and involved the whole thickness of the bone. On September 3d, 1864, a portion of the parietal, three inches by four, had become so much loosened that it was readily removed. Cicatrization then went on rapidly, and on December 2d, 1864, the wound had contracted to an ulcer less than an inch in diameter. The patient's mental faculties were impaired somewhat, the ward physician thought, but not to a great extent. A colored drawing was made representing the appearance of the parts prior to the separation of the exfoliation, No. 74, Surgical Series of Drawings, S. G. O., by Hospital Steward P. Baumgras, U. S. A. It is copied, in chromo-lithography, in the plate opposite page 207. The exfoliation, which was contributed, with a minute of the hospital record of the case, by Assistant Surgeon C. A. McCall, U. S. A., is represented in the accompanying wood-cut, taken from page 16 of Circular 6, S. G. O., 1865. The patient was discharged from service August 31st, 1864, and from the hospital February 1st, 1865. He was pensioned; the examiner, Dr. Julius Nichols, stating that he was totally disabled, and that the case was the most extraordinary that had come under his observation; the pulsations of the brain, uncovered by dura mater, and the trunk of the meningeal artery being distinctly visible. He went to his home in Montgomery County, Pennsylvania. In April, 1871, he wrote to the compiler of this volume as follows: * * "The space the bone was taken out of is three and a half by two inches. In feeling the place lightly, it goes all through my head. It is all healed over like a thin shell. I am compelled to lie on my left side when sleeping. When exposed to the sun a dull pain through my head is caused. * * I have received but seven dollars a month. My pension papers call for eight dollars."

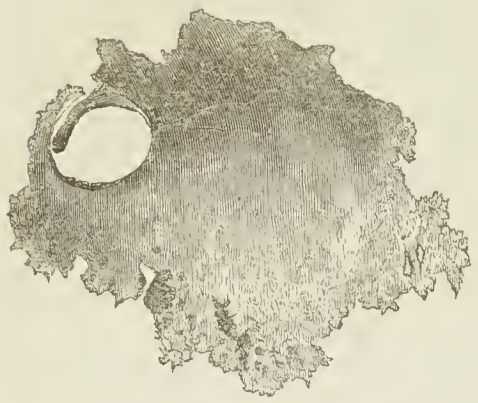

Fig. 141.—Exfoliation from the right parietal bone. *Spec.* 3452, Sect. I, A. M. M.

Case.—Sergeant George Oughiltree, Co. A, 12th United States Infantry, aged 22 years, was wounded at the battle of Gaines Mills, Virginia, June 27th, 1862, by a conoidal ball, which entered the skull on the right side, on a line with and one inch in front of the parietal eminence, and fractured and slightly depressed the internal table. The wound bled freely, and he was rendered insensible for a short time. When sensibility returned, he found that his left arm was completely paralyzed. He was taken prisoner, and conveyed to a Confederate field hospital, where he was accidentally wounded by a round ball, which comminuted the tibia and fibula, and lodged beneath the skin, but which was removed by a Confederate surgeon. Cold water dressings were applied to the wounds. During the first night patient had three or four convulsions. The paralysis of the arm continued for eight days after the injury, when it gradually disappeared. The ball still remained in the head, but no brain symptoms appeared. On July 27th, he was exchanged, and removed to a hospital boat. The upper end of the lower fragment of the tibia was protruding, and the soft parts were in such a condition as to render amputation through the upper third necessary, which was performed by Dr. Drake while the patient was under the influence of ether. At the same time the skull was trephined by Dr. Pierson. Several pieces of necrosed bone were removed from the posterior superior angle of the right parietal bone. A piece of ball, irregular in shape, was also removed at the same time. The removal of the latter was followed by the discharge of about two drachms of healthy pus from an abscess in the substance of the brain. He was subsequently transferred to Philadelphia, entering Broad and Cherry Streets Hospital, on the 31st, in good general condition. The stump looked well, the wound of head was discharging healthy pus, and the brain pulsations were distinctly visible. A dry dressing was applied to the stump, and a flax-seed poultice to the head. He was ordered a good diet, with milk punch and beef tea. In a few days inflammation of the stump appeared, followed by slight sloughing of the lower flap, and a stimulating poultice was applied. He improved rapidly. The stump healed by granulation, but the last ligature was not removed until two months later, and during that time two small pieces of exfoliated bone were removed. In November, the stump was discharging slightly, and brain pulsations were still visible in the wound of head. On April 22d, 1863, he was sent to the Ward Hospital, Newark, New Jersey, and transferred to the Veteran Reserve Corps on August 14th, 1863. He was perfectly well, and wore an artificial leg; the opening in the cranium was nearly closed by new deposit of bone. A communication from the Commissioner of Pensions dated April 22d, 1868, states that Oughiltree was a pensioner, and that his disability was rated as total and permanent. The early history of the case is reported by Acting Assistant Surgeon John Neill.

Case.—Sergeant *F. M. Robinson*, Co. I, 2d Kentucky Regiment, aged 26 years, was wounded on May 14th, 1864, by a shell, which fractured and depressed both tables of the cranium at the right parietal eminence to the extent of one-half square inch, and denuded the skull for a space as large as the palm of the hand. There was also a severe flesh wound near the inferior angle of the scapula. He was unconscious for fourteen hours following the injury, but when admitted into the Institute Hospital, Atlanta, Georgia, on the 17th, he was conscious. There was great pain, with ecchymosis, extending around the right eye and over the face; the pupils were contracted; pulse slow and feeble; skin cool. From this time until the 23d, his condition remained about the same; the wound did not suppurate, and he suffered great pain over the whole head, for which opiates were freely given. On the 25th, suppuration was established, and a soft, fluctuating tumor formed, extending over the left side of the scalp and left eye. On the 30th, the wound began to slough badly, with a gangrenous tendency. On June 8th, he had a slight convulsion, followed by another on the 9th, but on the 10th, he was very cheerful, his pulse being regular, appetite good, and

the wound looking healthy. Late at night of the 11th, he had another very slight convulsion. On the following day chloroform was administered, and the depressed plate of bone, half an inch square, removed by sawing through a small triangular portion of the outer table. This gave free access to the depressed portion, which, with several spiculæ, was removed by forceps and elevator. About a teaspoonful of pus, with disorganized membranes and cerebral substance, was removed at the same time. The patient was very cheerful on the day following the operation. On June 14th, he had another slight convulsion, but from that date he steadily improved, and on the 30th, the wound was in a healthy granulating condition; the large surface of denuded skull seemed to be diminishing and covering over slowly, and there was every prospect of speedy recovery. The case is reported by Surgeon D. C. O'Keefe, P. A. C. S.

Case.—Private Jonathan G. S———, Co. D, 209th Pennsylvania Volunteers, aged 28 years, was wounded at Fort Steadman, Virginia, March 25th, 1865, by a conoidal ball, which fractured the cranium. He was admitted to the hospital of the 3d division, Ninth Corps, and thence sent to the Armory Square Hospital, Washington, where he arrived on March 28th. An examination revealed a fracture of both parietal bones, immediately over the sagittal suture and superior longitudinal sinus on a line drawn from ear to ear. The patient's intellect appeared unimpaired; pulse slow and tolerably full. He was unable to move his lower extremities, but the sensation remained unaffected; tickling the sole of the foot caused involuntary shrinking of the foot and leg. He voided his urine and fæces without difficulty. On the 30th, Surgeon D. W. Bliss, U. S. V., applied the trephine, and removed a small portion of sound bone and several detached pieces, which were firmly wedged between the two parietal bones, and had partially been driven beneath the internal table. Simple dressings were applied, and stimulants and nourishing diet ordered. After the operation, patient suffered no pain, and was able to move his legs. He recovered, and was discharged from the service on May 26th, 1865. The specimen is No. 4036, Sect. I, A. M. M., and consists of two fragments of bone from the sagittal suture, about one-half square inch in surface, including both tables. The specimen and history were contributed by Surgeon D. W. Bliss, U. S. V. This patient was pensioned, and in October, 1865, Pension Examiner J. L. Swesserott reported that he had left hemiplegia, a large depression along the sagittal suture; the toes of the left foot were constantly cold and destitute of sensation. In April, 1871, no further information regarding the case could be found on the files of the Pension Bureau.

Case.—Private William J. Scheetz, Co. C, 95th Pennsylvania Volunteers, aged 25 years, was wounded at the battle of Gaines's Mill, Virginia, June 27th, 1862, by a conoidal ball, which entered the *os frontis* two inches anterior to the coronal suture, and a little to the right of median line, and fractured both tables. He was conveyed to the hospital at Annapolis, Maryland, where his injury was treated as a wound of scalp only. He was, on August 16th, transferred to Annapolis Junction, and thence returned to duty on August 26th, 1862. The middle of March, 1863, he was suddenly seized with symptoms of meningitis. He was taken to the regimental hospital, and thence sent, on April 27th, to the 1st division, Sixth Corps, hospital, where he arrived in a comatose condition. He remained so until the 30th, when it was decided to operate. Ether was administered, and Surgeon E. B. P. Kelly, 95th Pennsylvania Volunteers, made a crucial incision three inches long, and removed nearly two inches square of the *os frontis* with trephine and Heys's saw. A piece of bone three-fourths of an inch in length, was found firmly imbedded in the dura mater, and was with some difficulty removed by a pair of forceps; a dark coagulum of blood was also taken out. The integuments were drawn together by five interrupted sutures, and cold-water dressings were ordered to be diligently applied. Half an hour after the operation, patient expressed a sense of relief; being the first word spoken in four days. Forty-eight hours afterward, there being much tumefaction of the parts, two sutures were removed. On June 13th he was transferred to Lincoln Hospital, Washington. Cicatrization of the wound was almost complete, and the patient's general health was much improved. On June 20th he was transferred to Mower Hospital, where he remained until the 25th of February, 1864, when he was transferred to the Veteran Reserve Corps. He entered the general hospital at Frederick, Maryland, on the 29th of August, 1864; was, on September 8th, transferred to Jarvis Hospital, Baltimore, Maryland, and September 12th sent to McClellan Hospital, Philadelphia, where he was discharged from the service on October 11th, 1864.

Case.—A *Confederate Soldier* was admitted to the Confederate hospital at Resaca, Georgia, with a shell wound of the head, received two days previous. The missile had struck just above the left ear, dividing the integuments two inches perpendicularly. The wound was immediately opened, revealing a rectilinear fracture full two inches in length; at the upper end it extended at an obtuse angle in the direction of the junction of the sagittal and lamboidal sutures; at the lower end the fracture run obliquely in the direction of the mastoid process of temporal bone, making a line fracture of at least four inches. The whole of the posterior fragment was depressed the entire thickness of the skull bone; there was also a semi-lunar fracture anterior to the above, having a fragment near half an inch in width partially detached. There were symptoms of compression of the brain, and the patient was comatose and insensible. On the fifth day after the reception of the injury, the trephine was applied in such a manner as to cut across the fragment into the sound bone anterior to the fracture. A portion of loose bone was removed, the elevator applied, and the depressed bone brought to its natural position. On the surface of the dura mater was found a collection of coagulated blood and fibrin, which was removed; no anæsthetic was used. As the dressings were applied, consciousness returned, and the patient asked several questions as to the condition of his head, and the probability of a fatal termination; thenceforward improvement was uniform, and ultimately the recovery was perfect.

Case.—Private W. H. Underwood, Co. D, 44th Indiana Volunteers, aged 19 years, received at the battle of Shiloh, Tennessee, April 6th, 1862, a gunshot wound in the head. After the reception of the injury, he walked from tree to tree until he became insensible; revived the next morning by a drink of water from a Confederate soldier, he walked to an encampment near by, and was thence removed to a hospital transport. He lay in the hold of the boat, very near the furnace, for two days and a half. He was admitted to Hospital No. 6, Louisville, Kentucky, on April 15th, 1862. There was a wound of entrance in the left temple, with apparently no corresponding wound of exit; but a small incision was found in the middle of the forehead, from which the patient stated a ball had been extracted on the field. On the outer aspect of the left upper eyelid were two incisions, made by buckshot, which caused so much swelling as to entirely close the eye. He complained of severe pain in the head, and numbness of the left leg. The left pupil was dilated. The probe was introduced into the wound of the left temple, and made

its exit through the small incised wound at the middle of the forehead; but the pain caused by the examination was so excessive that further attempts at an accurate diagnosis were discontinued. Ice bags were applied to the scalp, and tepid water to the wounds. As coma gradually supervened, a more thorough examination of the wound was determined upon. The patient was placed under the influence of chloroform, a T-shaped incision made over the *os frontis*, and the flaps were dissected up so as to expose the main seat of injury. This revealed a well-marked triangular depression; the base of the triangle being intact, while its apex was more depressed than any other part of it. The point of the apex was broken off, leaving an aperture through which an ordinary probe could be introduced readily. From either side of the depression, a line of fracture extended to the squamous portion of the temporal bones. Near the aperture in the jaws of the triangular fracture was a single hair, which had been forced there and left behind in the track of some foreign body. The centre pin of the trephine was now placed so as to include parts of the triangular depression in the button of bone which was removed. The brain appeared black and disorganized, as if ploughed by a foreign body; and at the depth of about one and three-fourths inches the probe struck a bullet, which was extracted and proved to be elongated and of a cork-screw shape. The elevator was then applied to raise the depressed portion of the frontal bone, but it sprung back by its own elasticity. The flaps were now brought together again, cold-water dressings applied, and the patient taken to a quiet, darkened room. The coma had been relieved by the operation. On June 10th the wound of operation had entirely healed, the eyelid and track of the ball across the forehead were almost well, and the patient complained of nothing but weakness. On June 11th, in consequence of the excitement caused by the arrival of his sister, a relapse took place. Delirium occurred, lasting for two or three hours, the eyelid became rapidly inflamed, and free suppuration recurred. Antiphlogistic treatment was at once resumed, and in a few days the unfavorable symptoms disappeared. The patient was discharged from the service September 20th, 1862. He reënlisted, however, July 15th, 1863, in the 2d Indiana Cavalry, and died at the post hospital at Macon, Georgia, of intermittent fever, May 14th, 1865. In this case, the course of the ball was very remarkable. After striking the left temple, it coursed across the forehead, until it reached the centre, which was indeed the most prominent part, and gave the greatest angle of divergence; yet strangely enough, at this point the ball fractured the skull; the triangular portion defined by the fracture yielding so as to let the ball pass inward, and then springing back, left a very small aperture. The ball which the patient stated was removed on the field, was evidently only a part of the ball extracted from the cerebrum, shaved off as it bored its way through the skull. The case is reported by the operator, Assistant Surgeon B. Howard, U. S. A.

Case.—Private *H. Vanduesen*, Co. C, 4th Texas Regiment, was wounded at the battle of Gettysburg, Pennsylvania, July 3d, 1863, by a musket ball, which fractured the anterior superior portion of the right parietal bone, making a radiated depression of the outer table. The cicatrix formed regularly, and he returned to his command. Epileptic fits supervened in September, 1863, and gradually became more frequent and intense until March, 1864, when he was again admitted to a hospital. At that time the cicatrix was four and a half inches in length, pointing obliquely backward under an angle of 60° with the coronal suture, deepening and widening in its centre, and presenting a depression of three-eighths of an inch in depth; the scalp here is radiated, as if the covering had assumed the abnormal condition of the bone beneath. The epileptic paroxysms were now composed of a number of successive convulsions. His general condition previous to an attack was marked by dejection of spirits, vertigo, and apathy; his bowels habitually costive, appetite wanting, urine scanty, pulse 60 and feeble, and face pale. Extravasations being supposed to exist, it was decided to apply the trephine. Chloroform having been administered, Surgeon B. Roemer, P. A. C. S., made two incisions in the form of a T; one nearly parallel with the coronal suture, upon the upper margin of the parietal bone, about half an inch from the cicatrix, and uniting with it; the second over the upper third of the cicatrix, and behind it. The first measured three and a half inches, and the second four inches. The trephine was applied at the upper part of the depression. The bone came away with the trephine, and no adhesions of the dura mater existed. Immediately below, and almost in the centre of the opening, lay a violet-colored, circular, and somewhat convex extravasation, covered by the dura mater, which was divided by a simple cut. No hæmorrhage occurred from beneath the skull, and three small arteries of the scalp had been readily controlled without ligation. The extravasation being removed, the wound was closed with adhesive straps, and cold water dressings and a cross-bandage applied. The patient reacted well from the effects of the chloroform, and walked about in his quarters on the second day. The wound healed by first intention. Two weeks after the operation he expressed himself as free from any unpleasant feelings. The condition of his bowels became healthy, his general aspect cheerful, and the prognosis was highly favorable to complete recovery. The case is recorded by the operator, Surgeon B. Roemer, P. A. C. S.

Case.—Corporal Frederick Weber, Co. E, 116th New York Volunteers, aged 22 years, was struck at the battle of Cedar Creek, Virginia, October 19th, 1864, upon the upper portion of the left side of the forehead by a conoidal musket ball, which denuded the frontal bone near the coronal suture for a considerable space, producing, as was stated by the attending physician, an indentation at the place of impingement, but no apparent fracture. The man was insensible for some time, though perfect reaction at length ensued. He was on the following day admitted to the depot field hospital; on October 22d, transferred to the hospital at York, Pennsylvania; and on November 7th furloughed to visit his friends in Buffalo, New York. On his arrival at that place he was attacked with pneumonia, and came under the care of Acting Assistant Surgeon S. W. Wetmore. Upon examination of the wound of the head, which was at this time discharging freely, a fracture in the external table was discovered; a piece measuring one and a half inches by two and one-fourth inches being loose, though not displaced. Having recovered from pneumonia, he was, on December 1st, admitted into the hospital of the city. On December 17th, Acting Assistant Surgeon J. F. Miner removed the irregular-shaped loose piece of bone of the external table, as well as fragments of the internal plate. The wound afterward healed kindly though slowly, and the man was discharged from service on June 7th, 1865, enjoying then good health, with the exception of an occasional pain in the region of the wound. In July, 1868, he was a pensioner at $8 per month, his disability being total and permanent. The case is reported by Acting Assistant Surgeon S. W. Wetmore. Subsequently Dr. H. N. Loomis of Buffalo reported that this patient had a painful cicatrix depressed half an inch, and suffered from defective vision and vertigo, with chronic irritability of the brain, which unfitted him for any kind of labor. Thereupon his pension was increased to $20 per month.

Case.—Private Philip A. W———, Co. A, 50th Pennsylvania Volunteers, aged 21 years, was wounded at Petersburg, Virginia, July 30th, 1864, by a conoidal ball, which imbedded itself in the integument and muscles of the left side of the head, fracturing and depressing a portion of the skull a little above and to the left of the occipital protuberance. The missile was removed by the hand. He was somewhat stunned by the blow, but arose and walked to the hospital of the 3d division, Ninth Corps, when he became unconscious and remained so for eighteen hours. On the following day he returned to his regiment, not knowing that his injury was severe, but he was returned to the hospital, where he remained for one week. He suffered severe headache and was unable to see or hear well. On August 11th, he was admitted into the Soldier's Rest, branch of 1st division hospital, Alexandria, Virginia. He seemed to improve for two days, then grew worse, complaining of pain in the frontal region of the head, especially over the left orbital ridge. On the 16th, he became unconscious for about two hours. It being deemed advisable to remove the depressed portion of bone, ether was administered, and Assistant Surgeon Theodore Artaud, U. S. V., made a crucial incision, half an inch in length, directly over the injury, and dissected up the occipito-frontalis muscle, revealing an indentation, half an inch in length, making a very regular cup-shaped depression, three-fourths of an inch in diameter, with a slight fissure around its edge and an irregular one across its centre. The trephine was applied so as to partially cover one side of the depression, and a portion of the skull was removed. The depressed bone was then removed by the elevator, exposing the dura mater, which was found to be healthy. A circular tent was applied over the exposed portion of brain, the wound dressed with cold water dressings, and morphia given to quiet the patient. The following day he was able to sit up, and by the 20th could walk about. On the 26th, he was seized with violent signs of compression, but was soon relieved by sinapisms to the neck, abdomen, and extremities. Croton oil was given, and afterward the wound, which had nearly healed, was enlarged and kept open with tents for three days, with but slight inconvenience to the patient. He had slight headache on the morning of September 1st, but his general condition was good and improving. He ate and slept well, and by the 22d, the wound had entirely closed. He occasionally complained of slight headache, and was, to all appearances, cured. He was transferred to Slough Barracks, branch of 3d division hospital, on October 5th, remaining until May 10th, 1865, when he was sent to the Augur Hospital, Alexandria, and thence, on the 20th, transferred to the McClellan Hospital, Philadelphia. He was discharged from the service on July 6th, 1865. A communication from the Commissioner of Pensions, dated July, 1868, states that Wiest is a pensioner at $8 per month, his disability being rated total and temporary. The specimen was contributed, with an history, by the operator, Assistant Surgeon Theodore Artaud, U. S. V.

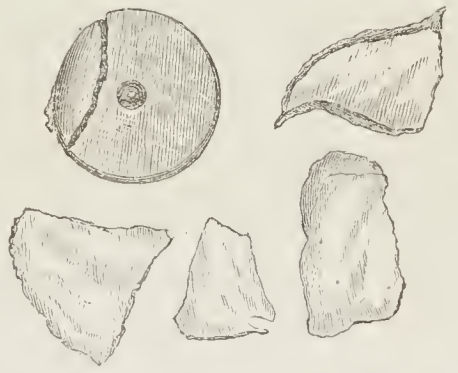

Fig. 142.—Disk and fragments removed after a fracture by a spent ball. *Spec.* 5042, Sect. I, A. M. M. [Nat. size.]

Case.—Captain Alvin M. W———, Co. K, 17th New York Volunteers, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a musket ball, which fractured the left parietal bone near the eminence. He walked with some assistance to the hospital of the Third Corps, a distance of more than a mile. His voice became thick and had an unnatural hesitancy and slowness. The middle and ring finger of the right hand were paralyzed, but the motion and sensibility in the first and fourth fingers were only slightly impaired. His mental faculties were clear. He complained of a slight headache and his pulse was slow and full. The trephine was applied by Assistant Surgeon Lewis Tice, 17th New York Volunteers, and a disk of bone and several fragments were removed, one of which was three-fourths of an inch in diameter. The edges of the wound were approximated by adhesive strips, and cold water dressings were applied. During the operation, blood flowed profusely from the perforation. One large fragment of bone, evidently from the inner table, lay exactly beneath, but was too large to be extracted from the orifice. The dura mater was found to be uninjured. The power of articulation returned immediately after the operation, and the numbness of the fingers became less marked. On January 2d, 1863, the paralysis of the fingers had entirely disappeared and the wound was healing by granulation. The patient was mustered out with his regiment on June 2d, 1863. The pathological specimen is No. 4049, Sect. I, A. M. M., and was contributed by the operator. The Commissioner of Pensions reports that this officer was pensioned at $20 per month. A musket ball entered the upper portion of the right parietal bone; bones have been removed so that an irregular opening exists of the size of a silver dollar. Pension Examiner T. C. Pitt states that his right hand and tongue were partially paralyzed. Exercise produces violent throbbing at the wound and at a point opposite on the back of the head. His general health is very poor, probably owing to the constant irritation about the brain.

Fig. 143.—Disk and fragment from a gunshot depressed fracture of the left parietal. *Spec.* 4049, Sect. I, A. M. M.

Case.—Private Joseph Wolf, Co. F, 7th New York Heavy Artillery, aged 22 years, was wounded on April 3d, 1865, before Petersburg, Virginia, by a conoidal ball, which entered the scalp near the posterior superior angle of the right parietal bone, and glanced upward, denuding the bone of periosteum for a space one inch in circumference. He was on the same day admitted to the hospital of the 1st division, Second Corps, and thence conveyed to Washington, where he entered the Armory Square Hospital on the 12th, with complete paralysis of the left arm and leg. He was slightly comatose, but could easily be aroused, and answered questions intelligently; the pupils were contracted. An examination revealed a fissure extending beyond the denuded portion, through which pus slowly exuded, but no depression was observed. Ether was administered on the 14th, and Surgeon D. W. Bliss, U. S. V., applied the trephine. Upon removing the button of bone, a similar fissure through the internal table was discovered. The dura mater protruded through the opening, and, upon puncturing the membrane, about three ounces of sero-sanguineous fluid

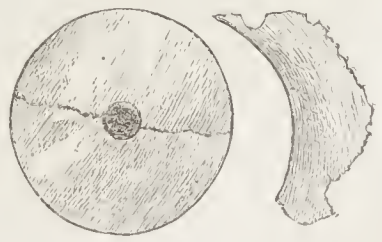

Fig. 144.—Disk and fragments removed after gunshot fracture of the right parietal. *Spec.* 4105, Sect. I A. M. M.

escaped. The operation afforded no immediate relief to the patient, but at the end of six hours he could move his hand and foot, and on the following day could raise his head. On the 20th, the wound was granulating finely, and the patient doing well. He could move his leg and arm freely on the 26th, and was able to stand upon his feet. On May 1st the paralysis had almost disappeared, and the wound was entirely covered with granulations. Two days later a small circle of necrosed bone was removed from the external table. The patient was now able to walk about the ward, and on the 26th, was transferred to the Whitehall Hospital, near Bristol, Pennsylvania, whence he was discharged from the service on June 20th, 1865. His claim for pension was "pending" December 7th, 1871. The specimen is a disk of bone with a serrated fragment of the inner table of the right parietal bone, and is represented in the wood-cut. The disk is one inch in diameter, and is traversed by the line of fracture. The specimen was contributed by the operator, Surgeon D. W. Bliss, U. S. V.

CASE.—Private George A. Shaffer, Co. D, 190th Pennsylvania Volunteers, aged 19 years, was wounded at Five Forks, Virginia, April 1st, 1865, by a conoidal ball, which fractured the parietal bones at the junction of the coronal and the sagittal sutures, the fracture extending back about three inches over the sagittal suture. He was on the next day admitted to the hospital of the Fifth Corps, and on April 4th sent to the Lincoln Hospital at Washington. There was but slight evidence of compression, but on April 6th, he complained of pain in the head; the pupils became dilated, and coma supervened. He was placed under the influence of ether. Surgeon J. C. McKee, U. S. A., then made a crucial incision at right angles to the parietal suture and removed the fragments, revealing the dura mater intact. The patient was kept quiet in a recumbent position, cold applications were made to the head, and low diet ordered. He recovered, and was discharged from the service on a surgeon's certificate of disability on June 24th, 1865. See Photographs of Surgical Cases, Vol. III, page 10. He is a pensioner. The case is reported by Surgeon J. C. McKee, U. S. A.

The following remarkable instances of patients recovering sufficiently to resume their military duties are reported:

CASE.—Lieutenant H. S. Robinson, Co. G, 36th Massachusetts Volunteers, received, at Blue Springs, Tennessee, October 12th, 1863, a gunshot depressed fracture of the right parietal bone. He was admitted into the hospital at Knoxville, Tennessee, the same day, where a portion of bone was removed by Hey's saw. He recovered, was returned to duty on December 26th, 1863, and was discharged from the service on July 7th, 1864. He was a pensioner in 1867. Active exertion caused headache and a feeling of pressure on the brain.

CASE.—Corporal Phineas Bird, Co. C, 100th Pennsylvania Volunteers, aged 21 years, was wounded at the siege of Knoxville, Tennessee, November 20th, 1863, by a conoidal ball, which fissured the left parietal bone without depression. He was conveyed to Hospital No. 5, where, on November 25th, the bone was trephined. He was furloughed on February 17th, 1864, and shortly afterwards returned to his regiment. On October 1st, he was admitted into the general hospital at Pittsburg, Pennsylvania, and, on the 20th, again returned to duty. He does not appear to have been an applicant for pension.

CASE.—Asa D. Broody, bugler of the 7th Indiana Battery, aged 20 years, was wounded at the battle of Kenesaw Mountain, Georgia, June 22d, 1864, by a conoidal musket ball, which fractured and depressed the right temporal bone. He was at once admitted to the 3d division, Fourteenth Corps, hospital, and thence sent to Chattanooga, Tennessee, where he arrived on the 29th of the month; two days subsequently, however, he was transferred to Hospital No. 2, at Nashville. He recovered, was furloughed, and finally returned to duty on September 19th, 1864. This soldier was discharged the service December 7th, 1864, and was pensioned. On September 4th, 1866, Pension Examiner J. G. Hendricks reports that the operation of trephining had been performed. There was paralysis of the left arm, and the flexor tendons of the fingers were contracted. His disability is rated total and permanent.

CASE.—Private Robert S. Erwin, Co. B, 86th Illinois Volunteers, aged 32 years, was wounded at Atlanta, Georgia, July 20th, 1864, by a conoidal ball, which fractured the superior portion of the frontal bone, and lodged in the cranium. A portion of the fractured bone was driven into the substance of the brain. He was, on the same day, admitted to the field hospital of the 2d division, Fourteenth Corps; conveyed, on July 22d, to No. 2, Chattanooga, Tennessee, and thence sent to Nashville, where he entered Hospital No. 1, on August 1st. On the 3d, Acting Assistant Surgeon John Grant made a triangular incision, two and a half inches in length, applied the trephine, and removed the fractured bone. The soft parts were swollen, and the dura mater lacerated. There was a free discharge of pus, of an unhealthy character, but the patient's constitutional condition was good. Simple dressings were applied to the wound. Erwin was transferred on December 12th, entered Jefferson Hospital, Jeffersonville, Indiana, on the 13th, and was returned to duty on December 21st, 1864. He was again admitted into Jefferson Barracks Hospital, St. Louis, on January 10th, 1865; on the 14th of April sent to Small-pox Hospital; and for the second time returned to duty on June 3d, 1865. This soldier was discharged the service August 16th, 1865, and afterwards pensioned. On January 19th, 1870, Pension Examiner I. H. Reeder reports that the patient had been subject to frequent attacks of epilepsy since he was wounded, which, within the last year had so increased in frequency and violence as to totally disqualify him for any kind of business or labor. He rates his disability total and permanent.

CASE.—Private Wm. H. Freshwater, Co. G, 45th Ohio Volunteers, aged 18 years, was wounded at Resaca, Georgia, May 14th, 1864, by a conoidal musket ball, which fractured the left parietal bone. He was admitted to the hospital of the Twenty-third Corps on the same day. The trephine was applied and all the fragments of bone were carefully removed. He was sent to the field hospital at Bridgeport, Alabama, on the 21st; transferred to Nashville on the 23d; to Clay Hospital, Louisville, on the 27th; to Dennison Hospital near Cincinnati, on June 20th; and thence to Seminary Hospital, Columbus, Ohio, on July 1st. He recovered, was furloughed on July 7th, returned on August 8th, and was sent to his regiment for duty on August 11th, 1864. He was discharged June 12th, 1865, and pensioned. His disability is rated one-half and temporary.

Case.—Private Edward Gordon, Co. H, 6th New York Cavalry, was wounded while on picket near Yorktown, Virginia, September 18th, 1862, by a conoidal ball which fractured and depressed the left parietal bone near the anterior inferior angle. He was admitted to the Nelson Hospital, being unable to speak, yet able to walk, and seemingly conscious. The trephine was applied, a button of bone removed, and the depressed fragment elevated. While lifting the depressed bone, the left side of his face was subject to violent convulsions, which ceased as soon as the fragment had been removed. A pretty free hæmorrhage from the middle meningeal artery ceased spontaneously, apparently from pressure of the brain. The patient recovered rapidly and was returned to duty on December 10th, 1862. He is not a pensioner.

Case.—Private William Hines, Co. A, 20th Wisconsin Volunteers, was wounded at Prairie Grove, Arkansas, December 7th, 1862, by a conoidal ball, which inflicted a slight scalp wound midway between the anterior and posterior fontanelles, three-fourths of an inch to the left of the sagittal suture, and slightly indented the external table. The injury apparently caused no serious inconvenience, as no record of the case can be found until August 27th, 1863, when the man was admitted to the hospital at Keokuk, Iowa, suffering from typhoid fever. He was discharged from service on November 12th, 1863. It seems that he afterward re-enlisted in Co. D, 2d Wisconsin Cavalry, and served until January 2d, 1865, when he was admitted to the Adams Hospital, Memphis, Tennessee, on account of the injury received at Prairie Grove. The state of the patient was now approaching to idiocy. Involuntary movement of the extremities had existed more or less since the reception of the injury, and the patient complained of intense pain in the head, which was greatly aggravated when exposed to the solar rays. The scalp wound had healed, and an indentation of the skull could easily be detected, sufficient in size to receive one-half of a split pea. On the fifth day after admission, he was placed under the influence of chloroform, when Assistant Surgeon J. M. Study, U. S. V., made a semi-lunar incision three inches in length, reflected the scalp over the seat of injury, and placing the centre pin of the trephine in the indentation, sawed through the skull. After the operation the patient's progress was rapid. The treatment consisted of cold water dressings for thirty-six hours, when erysipelas set in, and tepid water dressings were substituted. By the fifth day the erysipelas had entirely subsided. The wound suppurated freely, the margin began to heal rapidly, and by January 18th the patient was going about the ward, and expressed himself as feeling well and free from all the head symptons which had existed prior to the operation. On February 12th, 1865, he was returned to duty entirely recovered. The case is reported by the operator. This man was discharged the service November 15th, 1865, and pensioned. On September 16th, 1867, Pension Examiner W. A. Anderson reports that the patient suffers great nervous disability, which is increased upon the least excitement. He is also blind in the right eye, the result of a kick by a mule at Vicksburg, Mississippi, on October 23d, 1864, which, in addition to his previous injury, unfits him for any occupation. His disability is rated total and permanent.

Case.—Private John Jastram, Co. B, 39th New Jersey Volunteers, aged 18 years, was wounded while on picket on December 4th, 1864, by a conoidal ball, which fractured the occipital bone. He was admitted on the same day to the field hospital of 2d division, Ninth Corps, where Surgeon L. W. Bliss, 51st New York Volunteers, trephined the skull. On the 7th, he was sent to City Point, Virginia, where he remained in the depot field hospital of the Ninth Corps until the 20th, when he was transferred to the McKim's Mansion Hospital, Baltimore, Maryland. On January 9th, 1865, he was sent to York, Pennsylvania, where he remained until April 17th, 1865, when he was returned to duty. This soldier was discharged the service June 20th, 1865. On December 14th, 1866, Pension Examiner A. W. Woodhull reports that the man complained of much pain in the wound. Upon a change of weather this was accompanied by dizziness and noises in the head, which prevented him from pursuing his occupation. He rates his disability one-half and permanent.

Case.—Private Riley Jump, Co. D, 11th Missouri Volunteers, aged 20 years, was wounded at Tupelo, Mississippi, July 14th, 1864, by a buckshot, which fractured the left parietal bone and lodged between the tables. He was admitted to the hospital of the 3d division, Sixteenth Corps, and thence conveyed to Memphis, Tennessee, where he entered the Adams Hospital on July 21st. On the following day severe and frequent convulsions occurred. Acting Assistant Surgeon S. S. Jessup administered chloroform, applied the trephine, and removed the buckshot and the depressed bone. Several convulsions occurred after the operation, but were easily controlled by chloroform, and ceased entirely on the fourth day. Stimulants and full diet were ordered, the wound healed readily, and on January 4th, 1865, the patient was returned to duty. The case is reported by Surgeon J. G. Keenon, U. S. V. He is not a pensioner.

Case.—Private A. P. Lowry, Co. I, 6th Iowa Volunteers, aged 19 years, was wounded in a skirmish on the Big Black River, Mississippi, July 6th, 1863, by a conoidal ball, which struck at a point two inches from and directly above the right ear, fractured the skull, and emerged two inches above and behind the wound of entrance. He was treated in the regimental hospital, where, on July 21st, Assistant Surgeon William S. Lambert, 6th Iowa Volunteers, trephined the skull and removed a large piece of bone which was pressing upon the brain. He experienced immediate relief after the operation. On August 2d, he was admitted to St. Mark's Hospital, Paducah, Kentucky, and, August 3d, sent to Mound City, Illinois. He stated that the first fifteen days after injury the wound was dressed with poultices, and that he was able to walk about until July 10th, when the wound became greatly inflamed. On admission to Mound City Hospital the wound had almost healed, and his health and appetite were good. He was furloughed on September 17th, 1863, and returned to duty December 2d, 1863. He was discharged July 16th, 1864, and pensioned. Pension Examiner Edward Whinery reports that the disability is total and permanent, but that the degree may become less.

Case.—Private Reuben Ramsey, Co. H, 93d Pennsylvania Volunteers, aged 21 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball, which fractured and depressed the left parietal bone to the extent of a ten-cent piece, about one inch above and one and a half inches anterior to ear. On the 9th, he was admitted into Harewood Hospital, Washington, where Acting Assistant Surgeon O. D. Brooks applied the trephine, and removed the depressed portions of bone. Cold water dressings were applied to the wound, and by June 22d he had so far recovered as to be able to go home on furlough. He was returned to duty on August 26th, 1863, entirely recovered. He is not a pensioner. The case is reported by the operator, Acting Assistant Surgeon O. D. Brooks.

Case.—Private James B. Sawyer, Co. G, 27th Michigan Volunteers, aged 25 years, was wounded in an engagement near Petersburg, Virginia, October 27th, 1864, by a musket ball, which entered the frontal sinus above the left eye. He was admitted into the field hospital of the 3d division, Ninth Corps, where the operation of trephining was performed by Surgeon W. B. Fox, 8th Michigan Volunteers. He was subsequently transferred to the hospital of the Ninth Corps at City Point, and thence, on the 29th, to Washington, entering Harewood Hospital on the 31st. He recovered, and was returned to duty on February 10th, 1865. He is not recorded as a pensioner.

Case.—Private Robert W. Thompson, Co. D, 99th Pennsylvania Volunteers, aged 18 years, was wounded at the battle of the Wilderness, Virginia, May 5th, 1864, by a conoidal ball, which fractured and depressed the upper part of the occipital bone, and lodged. He was conveyed to Washington, and entered Judiciary Square Hospital on the 11th. On the following day he was placed under the influence of ether, and Assistant Surgeon Alexander Ingram, U. S. A., trephined the skull, and removed the depressed portion of bone, beneath which the ball and a large firm clot were found. A piece of bone one inch long and half an inch wide, had been driven in upon the dura mater. The patient's constitutional condition was excellent. On the 14th, the head and face were attacked by erysipelas, which caused swelling, and completely closed the eyes. By the 19th, erysipelas had entirely disappeared, and the patient was nearly well. On the 27th of June, he was transferred to the Satterlee Hospital, Philadelphia, and on the 31st placed on duty as nurse; his wound being nearly healed. On November 28th, 1864, he was returned to duty. He is not a pensioner.

Case.—Sergeant Major George W. Wadsworth, 19th Maine Volunteers, aged 22 years, received, at the battle of Gettysburg, Pennsylvania, July 3d, 1863, a depressed gunshot fracture of the cranium. He was admitted to the Seminary Hospital, and on July 7th sent to Mower Hospital, Philadelphia. At intervals convulsions occurred, supposed to have been caused by depression of internal table. On July 22d the trephine was applied, and the depressed portion of bone removed by Acting Assistant Surgeon David McLean. On September 10th, a piece from the outer table came away. On November 14th the wound had nearly healed, and on December 4th, 1863, the patient was returned to duty. He was promoted to Lieutenant, and discharged June 30th, 1866, and pensioned. Pension Examiner Israel Putnam reports that the patient must avoid violent exercise and exposure to sun, being subject to vertigo.

Case.—Private Charles E. Wood, Co. D, 14th New York Cavalry, aged 18 years, received, near Petersburg, Virginia, June 22d, 1864, a gunshot fracture of the mastoid process of right temporal bone, also wound of right arm and hip. He was admitted to hospital 3d division, Ninth Corps, where Surgeon A. F. Wheelan, 1st Michigan Sharpshooters, excised spiculæ of the temporal bone. On July 2d the patient was sent to Mount Pleasant Hospital, Washington, and on July 22d to Mower Hospital, Philadelphia, whence he was returned to duty September 27th, 1864. He is not a pensioner.

Four patients recovered sufficiently to be returned to modified duty in the Veteran Reserve Corps:

Case.—Private John G. Colgan, Co. F, 5th New Jersey Volunteers, aged 22 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a piece of shell, which struck the upper portion of the frontal bone, causing a fracture with depression. He was conveyed to Washington, and on May 9th admitted to Harewood Hospital, where the trephine was applied, and the depressed portion of bone removed. On May 30th, the wound was doing well, and on June 24th, 1863, the patient was transferred to Satterlee Hospital, Philadelphia, where he was assigned to the 2d battalion, Veteran Reserve Corps. This soldier was discharged the service November 22d, 1865, and pensioned. There was a large cicatrix, with depression from loss of the outer table of the *os frontis*, near the junction of the coronal and sagittal sutures, with tenderness upon pressure, and the patient complained of vertigo when exposed to the sun, or when undergoing active exercise. His disability is rated one-half, and probably permanent.

Case.—Captain John W. Dempsey, Co. H, 82d New York Volunteers, received at the battle of Bull Run, Virginia, July 21st, 1861, a gunshot fracture of the skull. He was captured and not released until 1863, reaching Washington July 11th. The skull was trephined. He was furloughed on July 13th, and transferred to the Veteran Reserve Corps July 23d, 1863.

Case.—Sergeant Frank W. Douglass, Co. C, 141st Pennsylvania Volunteers, aged 20 years, was wounded at the battle of the Wilderness, Virginia, May 6th, 1864, by a conoidal ball, which fractured and depressed the frontal bone at the right supra-orbital region. He was conveyed to the hospital of the 3d division, Second Corps, and thence sent to Washington, and admitted to the Campbell Hospital on May 13th. Thence he was sent to the West's Buildings Hospital, Baltimore, on the 16th, and finally transferred to York, Pennsylvania, on May 21st. On June 1st, Surgeon H. Palmer, U. S. V., trephined the skull and removed thirty-four pieces of bone. He recovered, and on March 7th, 1865, was transferred to the Veteran Reserve Corps. The case is reported by the operator, Surgeon H. Palmer, U. S. V. Douglass was a pensioner in 1869, his disability being regarded as three-fourths and permanent. The examining surgeon, Dr. Turner, reports that both tables had been driven in upon the brain; that the patient suffers pain, is incapable of much exposure to the sun, and is afflicted with loss of memory and sometimes unconsciousness.

Case.—Private Collis H. Smith, Co. E, 118th New York Volunteers, aged 30 years, was wounded near Fort Darling, Virginia, May 16th, 1864, by a conoidal ball, which fractured and depressed the frontal bone near the longitudinal sinus. He was conveyed to the field hospital of the Eighteenth Corps, and on the 19th sent to the general hospital at Hampton, Virginia. On May 26th, Acting Assistant Surgeon H. B. White applied the trephine and removed several pieces of bone, giving exit to a large collection of pus. The patient was in a comatose condition and the external parts were softened and much contused. The removal of the bone and consequent discharge of pus, in a manner relieved the coma, but the reaction was very slow. By June 3d, the wound was closed and healing finely, and the patient was doing well. On October 15th, he was sent to the hospital at

Whitehall, Pennsylvania, and on January 20th, 1865, he was transferred to the Veteran Reserve Corps. The case is reported by Ely McClellan, Assistant Surgeon, U. S. A. This soldier was discharged the service September 4th, 1865, and was afterward pensioned. On May 12th, 1866, Pension Examiner George Page reports a depression at the original seat of injury. The patient suffered from cephalalgia, with occasional blindness and dizziness, and his memory was somewhat affected. His disability is rated one-half and permanent.

In the six following cases of recovery, after trephining for gunshot injury, the men were exchanged, paroled, or furloughed:

CASE.—Private *Patrick Lane*, was wounded at Irish Bend, Louisiana, April 14th, 1863, by a conoidal ball, which fractured and depressed the right parietal bone at its posterior superior angle and lodged, carrying with it portions of cap and hair. Simple dressings were applied. Four days after the reception of the injury, epilepsy supervened, and Surgeon W. N. Trowbridge, 23d Connecticut Volunteers, removed two buttons of bone with the trephine. No further treatment is recorded, but the report of Surgeon W. N. Trowbridge states that the patient recovered.

CASE.—Private *James H. Richardson*, Co. B, 19th Louisiana Regiment, was wounded at the battle of Shiloh, Tennessee, April 7th, 1862, by a round musket ball, which caused a depressed fracture of the cranium. He was admitted into Hospital No. 3, Evansville, Indiana, April 18th, 1862, being at the time in a state of general paralysis. The operation of trephining was soon afterward performed. The patient improved slowly, and on August 31st, was enabled to walk. On November 30th, he was transferred to Indianapolis, Indiana, and paroled on November 26th, 1862, still suffering from paralysis.

CASE.—Private *John Cotton*, Co. G, 17th Georgia Regiment, aged 23 years, received at Cedar Run, Virginia, August 9th, 1862, a gunshot fracture of the cranium, near the left parietal protuberance. The internal table was injured to a greater extent than the external plate. He was admitted into the Confederate hospital at Charlottesville, Virginia. On September 14th, the trephine was applied, and several pieces of bone were removed. The mind was not affected by the operation, but there was slight paralysis of the right side of the body. Ten days after the operation, erysipelas supervened, but was readily subdued. The patient did well, constantly improving until October 9th, 1862, when he was furloughed. The wound had entirely healed.

CASE.—Private *J. W. Hambleton*, of Latham's Virginia Battery, aged 37 years, received, at Cedar Run, Virginia, August 9th, 1862, a gunshot depressed fracture of the cranium, at the junction of the left temporal with the parietal bone. When he was admitted into the Confederate hospital at Charlottesville, Virginia, on August 11th, his mental and physical faculties were unimpaired. On the 24th the trephine was applied, and all fragments of bone were removed. About a week after the operation the patient had a slight attack of erysipelas of the scalp, but soon recovered from it. In March, 1865, he had entirely recovered, but was injuriously affected when exposed to the heat of the sun. The case is reported by Assistant Surgeon B. W. Allen, P. A. C. S.

CASE.—Private *J——— F———*, 9th Louisiana Regiment, was wounded at the battle of Murfreesboro', Tennessee, December 29th and 30th, 1862, by a shell, which struck over the right parietal bone, causing a contusion without producing any external wound, but depressing nearly one-half of the bone, leaving a cavity of considerable size. When admitted to the Lagrange Hospital his health was very poor; the left side was paralyzed and his intellect obtuse; the extremities were œdematous. The trephine was applied and a button of bone removed, revealing extensive fracture of the internal table, and an osseous tumor of nearly an inch in diameter, whose apex was removed by the trephine. The dura mater was in very good condition, though traces of inflammation were evident. A marked improvement manifested itself in a few days. His appetite improved, the œdema disappeared, and he was soon able to walk about the ward.

CASE.—Corporal *J. A. Gray*, Co. I, 12th Mississippi Regiment, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a fragment of shell, which struck the left parietal bone at the posterior superior angle, depressing both tables fully half an inch. He was conveyed to Washington, and on May 7th admitted to St. Aloysius Hospital. No untoward symptoms occurred until May 9th, when he was attacked by epileptiform convulsions, with complete loss of consciousness. On the following day the trephine was applied, and a button of bone, consisting of the external table only, was removed from the interior edge of the fracture. Fragments of the external table were then removed which had been driven backward between the tables beyond the point of fracture, depressing, to a considerable extent, the inner table, which presented on its exposed surface no fracture or even fissure. It being deemed that the removal of the fragments would permit of the gradual and spontaneous elevation of the inner table, and it being impossible to elevate it at the time without applying the trephine in a new position, it was determined to leave the case without further interference, unless symptoms of convulsions recurred. Ice was applied, and no untoward symptoms occurred. The inner table partially resumed its natural position, and became covered with new granulations. He was doing well on July 27th, 1863, and was sent to provost marshal's office August 25th, 1863.

The following thirty-five cases recovered after trephining for gunshot fractures of the skull, with different degrees of physical disability, and were discharged from service:

CASE.—Private John H. Ballard, Co. B, 42d Indiana Volunteers, aged 26 years, was wounded at Dallas, Georgia, May 25th, 1864, by a conoidal ball, which fractured the left frontal and temporal bones. He was admitted to the hospital of the 1st division, Fourteenth Corps, on May 27th, where the skull was trephined, and three inches of bone were removed. He was sent to the field hospital, Chattanooga, Tennessee, on June 2d; transferred to the Cumberland Hospital, Nashville, on the 3d; and thence furloughed on July 30th, and ordered to report to the medical director at the expiration of his leave. On September 13th he was admitted to general hospital, Evansville, Indiana, and discharged from service on February 13th, 1865, by reason of loss of vision of left eye. The case is reported by Surgeon G. Perin, U. S. A. Ballard was pensioned. On February 23d, 1865,

Pension Examiner B. J. Day, of Evansville, Indiana, reports that the wound has several times reopened, and that a piece of lead was removed. The man suffers from pain in head and dizziness.

Case.—Corporal W. W. Barlow, Co. B, 1st Maine Cavalry, aged 23 years, was wounded at Dinwiddie Court-house, Virginia, March 31st, 1865, by a conoidal musket ball, which caused a compound fracture of outer table of the *os frontis*, left side, with compound comminution of inner table. He was admitted into the Cavalry Corps Hospital at City Point, Virginia, on the following day, and transferred on April 4th to Washington, per hospital steamer Thomas Powell, entering Mount Pleasant Hospital on the same day. The case progressed favorably until the morning of the 7th, when the patient had convulsions, followed by intense headache. The fractured portion of the outer table was then removed. On the following day ether and chloroform was administered, and Assistant Surgeon H. Allen, U. S. A., removed two large pieces of the inner table through the opening which had been enlarged by the trephine. Small fragments of bone came away from time to time, but the case progressed favorably, and on the June 15th, 1865, the patient was discharged from the service and pensioned. His disability is total.

Case.—Captain A. V. Barber, Co. C, 31st Ohio Volunteers, aged 25 years, was wounded near Atlanta, Georgia, August 8th, 1864, by a ball, which entered two inches above the left orbital plate, fracturing the frontal bone. He was admitted to the field hospital of the 3d division, Fourteenth Corps, on the same day, and on August 27th was transferred to the hospital at Chattanooga, Tennessee. On September 10th, the patient was sent to the Officers' Hospital, at Lookout Mountain. Trephining was resorted to, and a portion of bone one inch in diameter was removed. The wound gradually healed; a cartilaginous septum taking the place of the removed disk of bone. He resigned on December 15th, 1864, and is not a pensioner.

Case.—Private Lorenzo Beaver, Co. E, 76th New York Volunteers, aged 24 years, was wounded at Gettysburg, July 1st, 1863, by a piece of shell, which fractured the cranium. He was conveyed to Seminary Hospital, Gettysburg, thence was sent to McKim's Mansion Hospital, at Baltimore, where he received a furlough on October 17th. At its expiration he entered the post hospital, Albany, New York. The operation of trephining had been performed some time previously, but at what date cannot be exactly ascertained. He was transferred to Baltimore, readmitted into McKim's Mansion Hospital on December 9th, and was transferred to Jarvis Hospital, Baltimore, where he was discharged the service on February 5th, 1864. On May 16th, 1864, Pension Examiner S. D. Willard reports that the man suffers from dizziness on bending or stooping. Being unable to bear exposure to the sun, and subject to epilepsy, he was entirely unable to labor. His disability is rated total and permanent.

Case.—Private Wesley Bonnett, Co. D, 111th New York Volunteers, was wounded at the battle of Gettysburg, Pennsylvania, July 3d, 1863, by a conoidal musket-ball, which fractured the right parietal bone. A few pieces of bone, and the ball, which was split in its long diameter, were removed on the field. He had received in the same engagement a penetrating wound of the lower lobe of right lung. He was taken to the regimental hospital, thence sent to Letterman Hospital, and on September 8th, 1863, admitted to Mower Hospital, Philadelphia. The wound of chest had entirely healed, and the patient's health was good. He stated that he had been attacked, about four days after the reception of the injury, by epileptiform convulsions, which continued at intervals of two days until July 16th, when they ceased; but on September 5th they returned with increased violence. On September 9th, eight small fragments were removed. On September 16th, a convulsion threatened, but was warded off by counter irritation and half a grain of morphia. On the 20th convulsions suddenly occurred, and recurred twice afterward on the 26th and the 27th, followed each time by slight fever. On September 30th, the patient was doing well with the exception of some headache occasionally, and the wound was healing kindly. He was discharged from the service on November 2d, 1863. From January, 1864, to May, 1868, with the exception of one interval of forty days, he had two or three convulsive seizures a week. On May 25th, 1868, the trephine was applied by Dr. Darwin Colvin, and some depressed bone removed. A large piece of semi-osseous material was removed by Hey's saw, and also two spurs of bone, which dipped down so that some pressure must have been constant upon the brain. In July, 1868, the wound had closed with healthy granulations, and the patient was nearly well. A complete history of the operation is published in the New York Medical Journal, vol. 7, page 422. The man is not a pensioner.

Case.—Private Sterling Bunnel, Co. G, 6th Connecticut Volunteers, aged 22 years, was wounded at Bermuda Hundred, Virginia, May 20th, 1864, by a conoidal ball, which fractured the right frontal bone, near its union with the parietal. He was admitted on the following day into the hospital at Hampton, Virginia, and thence transferred, on June 3d, to the Knight Hospital, New Haven, Connecticut, where he arrived on the 7th. Hæmorrhage had occurred the day previous, and the patient was very feeble. The wound looked healthy, and the case progressed favorably until the morning of the 12th, when severe hæmorrhage recurred from a branch of the anterior temporal artery. The bleeding vessel was ligated, and the hæmorrhage ceased. On June 16, the wound became unhealthy, red, and tumefied, and flax-seed and charcoal poultices were applied, and morphine in small doses and stimulants were ordered. Gangrene became fully developed on the following day. During the next day the slough was dissected and bromine applied. The gangrene was entirely arrested, and by the 30th healthy granulation had set in. During the afternoon of July 2d, severe convulsions, followed by loss of consciousness, supervened. The wound was carefully examined, but no depression could be discovered. An accumulation of pus being diagnosed, Acting Assistant Surgeon S. D. Wilcoxson applied the trephine. No pus was found, but a slight depression of the inner table was discovered and elevated. Low diet and perfect quiet were enjoined. No unfavorable symptoms recurred. The patient was furloughed on August 6th, and returned at the expiration of his leave, when the wound was reëxamined, and a portion of bone removed. From that time rapid improvement took place, and on September 3d, 1864, he was discharged from the service; his term of service having expired. The case is reported by the operator, Acting Assistant Surgeon S. D. Wilcoxson. On October 20th, 1864, Pension Examiner Henry Pierpont reports that the wound had not perfectly healed. The right eye was affected, and pulsation was plainly visible. Any excitement, or even a short walk, caused severe pain. His disability is rated total and temporary. Further information states that in 1869 Bunnel's disability was considered total. A portion of the skull four and three-fourths by one and three-fourths inches was missing. The pulsations of the brain were plainly visible, and excitement caused severe pain.

Case.—Private William Burt, Co. G, 2d New York Heavy Artillery, aged 30 years, was wounded near Petersburg, Virginia, June 17th, 1864, by a conoidal ball, which fractured and depressed the left parietal bone. He was admitted to the Second Corps field hospital at City Point, on June 19th, and conveyed to the Campbell Hospital, Washington, on the 28th. He was in a stupid condition, and the right arm and leg had become paralyzed. On the following day, Surgeon A. F. Sheldon, U. S. V., removed about one and a half inches square of depressed bone with the trephine. The patient rallied after the operation, and continued to improve. By the 20th of July he had regained the use of the paralyzed parts. On the 28th he was transferred to the Lovell Hospital, Portsmouth Grove, Rhode Island, where he remained until the 24th of August, when he was sent to the McDougall Hospital, Fort Schuyler, New York Harbor. He was discharged the service on December 15th, 1864. On August 13th, 1865, Pension Examiner E. Bradley reports that the patient's hearing and eyesight are very poor. There was partial hemiplegia of the right side, accompanied by anemia and weakness to such a degree as to incapacitate him for any manual labor. It appears that this man's health continued to deteriorate, as his pension was subsequently increased.

Case.—Private George W. Burton, Co. E, 5th Wisconsin Volunteers, aged 21 years, received, near Petersburg, Virginia, April 2d, 1865, a compound fracture of the occipital bone, and also a fracture of the left tibia. He was admitted to hospital 1st division, Sixth Corps, where the skull was trephined, and a portion of the left tibia excised. He was, on April 10th, admitted to Broad and Cherry Streets Hospital, Philadelphia, and on May 8th sent to Satterlee Hospital, where he was discharged from the service July 24th, 1865. He was pensioned, and in July, 1865, Pension Examiner E. A. Smith rated his disability total and permanent. The pulsation of brain was still visible. The leg was unhealed and the tibia necrosed.

Case.—Lieutenant *William O. Capers*, Co. C, 14th Tennessee Regiment, received, at the battle of Perryville, Kentucky, October 8th, 1862, a severe gunshot fracture of skull, with depression. He was admitted to a Confederate field hospital near Perryville, where the skull was trephined. He was discharged October 24th, 1862.

Case.—Private George W. Coates, Co. F, 8th Minnesota Volunteers, aged 18 years, was wounded at Murfreesboro', Tennessee, December 7th, 1864, by a conoidal ball, which fractured and depressed the right parietal bone near the coronal suture. He entered the general hospital at the above place on the following day. The wound was hot and painful. Violent and frequent epileptic convulsions commenced on the third day after the injury. On the 11th he was growing stupid, with tonic spasm of the muscles of the jaw and neck, and irregular and depressed pulse. He was placed under the influence of chloroform, and Surgeon Samuel D. Turney, U. S. V., trephined a portion of the inner table. Considerable hæmorrhage from the veins of the diploë ensued. He reacted promptly. A silver plate was inserted, and water-dressings were applied, and cathartics administered. The convulsions diminished in frequency and violence, and finally ceased entirely. On February 16th, 1865, the patient was transferred to Hospital No. 2, Nashville, Tennessee, and furloughed on February 28th, 1865. On April 2d he was admitted to the hospital at Murfreesboro', and was discharged from service July 4th, 1865. The case is reported by the operator. On August 2d, 1865, Pension Examiner S. Willey reported that the patient was weak and anæmic. The right limbs were smaller than the left, the pupils were dilated, and there was inability to distinguish objects with the left eye. His disability is rated total and temporary.

Case.—Private Andrew Cole, Co. D, 145th Pennsylvania Volunteers, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a conoidal ball, which fractured the frontal bone, right side, near the coronal suture. Another ball passed through the muscular substance of the thigh. He was admitted to Harewood Hospital, Washington, December 17th, 1862. On December 23d the skull was trephined, and loose fragments of bone were removed. No inflammation existed, and wound suppurated freely; several pieces of bone were removed at different periods, but in March, 1863, the wound had nearly healed. He was discharged December 21st, 1863, and pensioned. In February, 1864, Pension Examiner D. E. Belknap reports that the wound is still open and discharging, and that more bone will probably come away. The disability is rated total.

Case.—Private Russell M. Cool, Co. E, 9th Illinois Volunteers, aged 19 years, was wounded at Fort Donelson, Tennessee, February 15th, 1862, by a conoidal musket ball, which fractured and depressed a portion of both tables of the left parietal near the junction with the occipital bone. He was conveyed to Mound City, Illinois, and entered the hospital at that place on the 20th, when Surgeon E. C. Franklin, U. S. V., performed the operation of trephining, being obliged to apply the trephine in three places before the depressed bone could be elevated. Fourteen pieces were removed; the largest was the size of a five-cent piece. All the symptoms of compression were manifest; pulse 65; breathing stertorous. Twenty-four hours after operation the pulse was 85, the breathing natural, and the appetite good. Cold water dressings were applied. In about a week sloughing commenced and increased the size of the wound to five inches in length, by one inch in breadth. Two weeks after admission, Cool was furloughed. He returned to the hospital on June 21st, and was discharged the service on the following day. In the early part of 1866, he was examined by Pension Examiner Thomas S. Stanway, who states that "a little to the left of the junction of the parietal and occipital bones a depression is found, which would hold about two drachms of fluid. The man's health was good, but exposure to the sun's rays would affect him." On September 27th, 1867, Pension Examiner T. S. Stanway reported that partial amaurosis of the left eye had occurred, and that the disability increased upon exposure or fatigue. His disability is rated total.

Case.—Private Owen Fitzpatrick, Co. B, 63d New York Volunteers, aged 48 years, was wounded at the battle of the Wilderness, Virginia, May 5th, 1864, by a musket ball, which struck anterior to the superior angle of the occipital bone, fracturing both tables of the skull and depressing a portion of the bone to the extent of one-fourth of an inch. He was conveyed to Alexandria, Virginia, and entered the 3d division hospital on May 12th. Little, if any, constitutional disturbance existed; the patient ate and slept well and was able to walk about. On the 16th, he was placed under the influence of chloroform and ether, equal parts, and Surgeon Edwin Bentley, U. S. V., trephined the skull, removed a few small fragments, and elevated the depressed bone. No hæmorrhage followed the operation. Cold water dressings were applied, the head slightly elevated, and quiet and abstemious diet strictly enjoined. The case progressed without any untoward symptoms. On June 25th, some small

pieces of skull and shreds of cloth were removed from the wound. On September 26th, the wound had entirely healed and the patient received a furlough of thirty days, at the expiration of which he returned. On December 20th, 1864, he was discharged from the service on surgeon's certificate of disability, by reason of dizziness and headache which supervened any exercise. A communication from the Commissioner of Pensions, dated January 3d, 1868, states that Fitzpatrick is a pensioner, and that his disability is rated as one-half and permanent. The case is reported by Surgeon E. Bentley, U. S. V. On January 28th, 1870, Pension Examiner J. W. Foward reports from the National Military Asylum at Augusta, Maine, (of which institution the patient was an inmate,) that there was a deep indentation at the seat of the wound. There was complete loss of sight of left eye and the vision of the right eye was much impaired. The patient suffered from headache, dizziness, temporary loss of sight of right eye, and was unable to remain in the sun or perform any labor requiring stooping or much exertion. Since he was wounded he was subject to fits of an epileptiform character, which supervened upon unusual exertion. His disability is rated total and permanent.

Case.—Corporal E. Eugene Flagg, Co. K, 94th Illinois Volunteers, was wounded at the battle of Prairie Grove, Arkansas, December 7th, 1862, by a conoidal musket ball, which fractured and depressed the cranium two inches posterior to the coronal, and one and one-fourth inches to the left of the sagittal suture. Assistant Surgeon Archibald E. Stewart, 94th Illinois Volunteers, trephined the skull, and removed all fragments of bone, on the field. The patient was immediately admitted to the field hospital at Prairie Grove. In the beginning of January, 1863, his condition was favorable and daily improving, but the right leg was partially paralyzed. He was transferred to the general hospital at Springfield, Missouri, on February 15th, and discharged from service February 20th, 1863. The case is reported by Surgeon Ira Russell, U. S. V. On May 21st, 1867, Pension Examiner H. Conkling reports that the patient at times suffers from pain in the head and paralysis of the left leg. The left eye was also affected. His disability is rated two-thirds and permanent. Further information in 1869, regarding this man's pension, mentions the paralysis of the leg and the affection of the eye.

Case.—Private Joseph Freeland, Co. A, 30th U. S. Colored Troops, aged 18 years, was wounded before Petersburg, Virginia, July 30th, 1864, by a shell, which fractured the cranium. He was at once admitted into the hospital 4th division, Ninth Corps, where, on August 2d, Surgeon David Mackay, 29th U. S. Colored Troops, trephined the skull, and removed one and one-fourth inches of right parietal bone, while the patient was under the influence of chloroform. He was, on August 3d, transferred to hospital for colored troops at City Point, where he remained until August 8th, when he was transferred to L'Ouverture Hospital, Alexandria. The left arm and leg were paralyzed. He was discharged the service on June 8th, 1865. On May 15th, 1866, Pension Examiner B. Gesner reports that there was general paralysis of the side. He rates the patient's disability total and permanent.

Case.—Private Brazilla Grant, Co. A, 6th New Jersey Volunteers, was wounded at the battle of Williamsburg, Virginia, May 5th, 1862, by a musket ball, which fractured and carried away a portion of both tables of the parietal bone near the central part of the sagittal suture. The brain was involved. For several weeks he remained in the field hospital. On June 12th, 1862, he was admitted into the Wood Street Hospital, Philadelphia. The wound healed, and the patient was discharged from service on August 8th, 1862, in consequence of a partial paralysis of the right side. The case is reported by Assistant Surgeon C. W. Horner, U. S. V. On January 25th, 1867, Pension Examiner W. S. Combs reports that the operation of trephining had been performed. The result was a complete paralysis of the left side, incapacitating the patient for any kind of manual labor. He rated his disability total and permanent. A communication from the Commissioner of Pensions, dated December 9th, 1869, stated that Grant receives a pension of $15 per month, and that his disability is rated permanent.

Case.—Private Thomas Hailey, Co. K, 7th Minnesota Volunteers, aged 24 years, was wounded on August 9th, 1864, during a skirmish on the Tallahatchie River, Mississippi, by a conoidal ball, which struck the left parietal bone half an inch from the sagittal suture, depressed both tables for a space of one inch in diameter, and lodged. He was conveyed to Memphis, Tennessee, and entered the Jackson Hospital on the 12th. The lower extremities were paralyzed. The pulse was 85, feeble and compressible, and his spirits were very much depressed. The soft parts around the injury were extensively lacerated, and the depressed bone was so wedged that it was impossible to move it with an elevator. A few hours after admission, he was placed under chloroform, and Acting Assistant Surgeon Samuel S. Jessup trephined the skull anteriorly and externally to the point of injury, and removed the depressed bone. The lips of the incision were then brought together again by sutures. The patient reacted promptly. Ice water dressings were applied to the wound, drastic purgatives administered, and the patient placed on low diet. The paralytic condition ceased within a week after the operation, and progress was rapid. On October 6th, he was furloughed, the wound being nearly healed. He reported at the general hospital at Fort Snelling, Minnesota, on November 30th, 1864, and was discharged from the service on April 29th, 1865. He was examined in 1867, by Pension Examiner Otis Ayer. There was a depression about an inch and a half long, an inch wide, and five-eighths of an inch deep, midway between the frontal and occipital bones; had pain in head, perverted sensation in the limbs, and physical exercise produced a mental condition in which he was unable to recognize his most intimate friends. He is a pensioner.

Case.—Private Franklin Harris, Co. E, 145th Pennsylvania Volunteers, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a conoidal ball, which fractured both tables of the left parietal bone, depressing the inner table; he also received flesh wounds of left shoulder and right hand. He was taken to the field hospital of Hancock division, Second Corps, where, on December 22d, the trephine was applied, and fragments were removed and the edges of bone elevated. The patient improved gradually; was transferred to Broad and Prime Streets Hospital, Philadelphia, on January 6th, 1863, and thence sent to South Street Hospital, on January 11th. The brain pulsations were distinctly visible. Small pieces of bone came away nearly every day, but the scalp was granulating freely, and disposed to close over the opening. On January 20th, there being a boggy feeling in the vicinity of the wound, and considerable discharge from between it and the bone, free incisions were made in the scalp by Acting Assistant Surgeon J. Walter Tryon. By February 15th the discharge of pieces of bone had ceased; the patient had become drowsy and listless, but the discharge from beneath the scalp continued. Iron, quinine, and

beef tea were ordered. The patient's general condition was much improved, and the wound had nearly closed by the 23d of March, but he complained of much pain over the left eyebrow. He was discharged from the service on May 6th, 1863. He is not a pensioner.

CASE.—Private Philip L. Hart, Co. B, 7th Connecticut Volunteers, was wounded in the engagement at James Island, South Carolina, June 16th, 1862, by a shell, which fractured the cranium, and injured the right thumb, causing loss of first joint. He was probably treated in a field hospital until end of December, 1862, when he was conveyed per steamer Star of the South to New York City, entering St. Joseph's Hospital, Central Park, January 1st, 1863. He suffered from cephalalgia, occasional attacks of vertigo, and impairment of intellect. He was discharged February 2d, 1863, and pensioned. In May, 1864, Pension Examiner W. Ellsworth reports that the operation of trephining has apparently been performed; that the patient has pain in the head when exposed to the sun. Partial loss of thumb interferes materially with his work. The disability is one-third and permanent.

CASE.—Private Alvan A. Hasty, Co. K, 38th Massachusetts Volunteers, was, on June 17th, 1863, admitted to St. Louis Hospital, New Orleans, Louisiana, with a gunshot wound of the cranium. The operation of trephining was performed. The patient recovered; was furloughed on September 6th, and discharged December 15th, 1863, and pensioned. Pension Examiner George Stevens Jones reports that he suffers from pain in the head, vertigo, and nausea, which increases by over exertion or exposure to heat, and rates the disability two-thirds and probably permanent.

CASE.—Corporal William H. Hurst, Co. I, 150th Pennsylvania Volunteers, aged 22 years, was wounded before Petersburg, Virginia, July 15th, 1864, by a piece of shell, which fractured the left parietal bone, without known depression. He was, on the same day, admitted to the hospital of the 1st division, Fifth Corps, and on August 6th conveyed to the Grant Hospital, Willet's Point, New York Harbor, where he remained until September 21st, when he was sent to the Cuyler Hospital, Germantown, Pennsylvania. On May 10th, 1865, he was transferred to the Mower Hospital, Philadelphia. Only simple dressings had been applied to the wound up to this time. It seems that at this latter hospital the operation of trephining was performed. The man recovered, and was discharged from service on June 7th, 1865. On June 9th, 1865, Pension Examiner H. L. Hodge reports that the injury to the skull had been followed by necrosis, cephalalgia, loss of memory, and absent-mindedness. He rates the patient's disability one-half and probably permanent. A communication from the Commissioner of Pensions, dated March, 1868, states that Hurst is a pensioner, at four dollars per month, and that his disability is rated one-half and permanent.

CASE.—Sergeant Monroe Holloway, Co. I, 67th Ohio Volunteers, aged 25 years, was wounded in an engagement at Fort Wagner, near Charleston, South Carolina, August 18th, 1863, by a fragment of shell, which fractured the right parietal bone at the posterior inferior angle, causing a slight depression. He was rendered insensible by the shock, but soon recovered, and was carried to the hospital on Morris Island. In about forty-eight hours convulsions supervened, and continued for a week or more. Fragments from both tables were then removed, exposing the brain, and the convulsions ceased. On the 1st of September, he was sent to Hospital No. 1, Beaufort, South Carolina; the wound being dressed in the ordinary manner. On October 2d, he was transferred by steamer to the McDougal Hospital, New York Harbor. As late as December the wound had not closed, but convulsions had not recurred since the date of operation; no paralysis existed, and the patient was able to walk about; indeed, he declared that he felt well. On February 12th, 1864, he was sent to the DeCamp Hospital, and on June 21st, 1864, discharged from service at his own request. On August 29th, 1866, Pension Examiner W. Ramsey reports that the operation for trephining had been performed, and that the patient then complained of pain in the head, and dizziness. He was compelled to avoid mental as well as physical labor. His disability is rated one-half and permanent.

CASE.—Private Ambrose F. Jackson, Co. G, 7th Rhode Island Volunteers, received, at the battle of Fredericksburg, Virginia, December 13th, 1862, a gunshot injury of the cranium. He was admitted to the hospital of the 2d division, Ninth Corps; on December 20th, sent to Carver Hospital, Washington, and on January 6th, 1863, to Lovell Hospital, Portsmouth Grove, Rhode Island, where he was discharged on June 10th, 1863. On March 7th, 1867, Pension Examiner A. E. Ames reports that the patient had been trephined. He suffered from headache and dizziness, and his memory was so much impaired that he could not recollect the day or the year he was wounded. He recommends that the patient should have a full pension.

CASE.—Private Hezekiel Jackson, Co. K, 39th U. S. Colored Troops, aged 24 years, was wounded near Petersburg, Virginia, July 30th, 1864, by a shell, which fractured the right parietal bone. He also received a wound of right leg. He was admitted to hospital 4th division, Ninth Corps, where the operation of trephining was performed, on August 2d, by Surgeon David Mackay, 29th U. S. Colored Troops. One and a half inches of bone were removed. He was, on the same day, transferred to hospital for colored troops at City Point, Virginia, where he remained until August 8th, when he was sent to L'Ouverture Hospital, Alexandria, Virginia. The left arm had become paralyzed. He was discharged from service April 7th, 1865, and pensioned. Pension Examiner Wm. H. Clendenin reports that he has occasional headache, but no paralysis or loss of memory. The wound of leg is entirely healed, leaving no disability.

CASE.—Private J. W. Jenkins, Co. F, 48th Pennsylvania Volunteers, was wounded at the battle of Antietam, Maryland, September 17th, 1862, by a piece of shell, which caused a punctured fracture of the anterior superior portion of the left parietal bone, and depressed the inner table. He was admitted into Capitol Hospital, Washington, on the 23d, and thence transferred to the De Camp Hospital, David's Island, New York Harbor, on the 28th. On October 3d, Acting Assistant Surgeon William K. Cleveland applied the trephine to the point of fracture, and removed two pieces of the depressed internal table an inch and a quarter in diameter. A few drops of pus escaped. With the exception of a slight headache, there had been no symptoms to denote the presence of pus. Patient made an excellent recovery, and was discharged from the service on December 4th, 1862. The case is reported by Surgeon S. W. Gross, U. S. V. On December 23d, 1869, Pension Examiner D. L. Beeser, reports that the parts are well closed by a firm tissue, and that the patient alleges to suffer neuralgic pains and vertigo at times. His general appearance was good, and he seemed robust and healthy. He rates his disability at one-third. His claim for a pension was pending at the above date.

CASE.—Private John R. Kell, Co. G, 22d Illinois Volunteers, received, at the battle of Belmont, Missouri, November 7th 1861, a depressed fracture of both tables of the occipital bone, about one inch to the right of lateral sinus. He was conveyed by steamer to Mound City, Illinois, and entered the hospital at that place on the 13th. Surgeon E. C. Franklin, U. S. V., applied the trephine, removed the depressed bone, and pared off the suppurating edges of the scalp. A spicula of the inner table was found driven into the substance of the brain. The case progressed favorably, and on January 22d, 1863, Kell was furloughed. He subsequently returned to his regiment, and was discharged from the service by reason of epilepsia on July 16th, 1862. He is not a pensioner.

CASE.—Private Joseph Longhrey, Co. G, 22d Indiana Volunteers, was wounded at the battle of Perryville, Kentucky, October 8th, 1862, by a musket ball, which struck the parietal bone near the temporal ridge and above the ear, and comminuted both tables, depressing the external table one-fourth of an inch. On the 14th, he was admitted into Hospital No. 4, New Albany, Indiana. The wound was doing well, and there were no indications of injury to the brain. He continued to improve for two weeks, when he became restless at night and slightly delirious. On October 28th, symptoms of compression appeared, and an operation became necessary. Two sections of the injured bone were removed with the trephine. The inner table was found to be greatly comminuted, but there was no evidence of pus having formed in the brain. For several days he had wild delirium, which finally gave way to active purgation. He recovered, with the exception of a slight nervous derangement, and was discharged December 4th, 1862. The case is reported by Acting Assistant Surgeon M. N. Elrod. On January 21st, 1863, Pension Examiner George W. Mears reports that the wound had healed, and that the man, although previously weak, then labored without inconvenience or pain in the head. He rated him as not disabled. A communication from the Commissioner of Pensions, dated January 3d, 1868, states that Loughrey is not entitled to a pension, having been rejected by the examining surgeon July 17th, 1863.

CASE.—Private Thomas A. Moore, Co. K, 33d Missouri Volunteers, aged 23 years, was wounded at the battle of Helena, Arkansas, July 4th, 1863, by a conoidal ball, which fractured and depressed both tables of the frontal bone above the right frontal eminence. He was conveyed to Memphis, Tennessee, and admitted into the Gayoso Hospital on the 7th, with slight symptoms of compression. Acting Assistant Surgeon S. Leslie performed the operation of trephining, leaving an opening an inch and three-fourths by one inch. The depressed portion of bone was much comminuted, and a portion of the ball was wedged into the fracture. A large quantity of blood was found in the brain. The following day the patient was doing well. Water dressings and low diet were ordered. On the 9th, and again on the 11th and 12th, hæmorrhage occurred from the wound, amounting to twelve or thirteen ounces; otherwise the case progressed without any untoward symptoms, and on September 1st Moore received a furlough for thirty days, at the expiration of which he was admitted into the Jefferson Barracks Hospital, St. Louis, Missouri. He was discharged the service December 14th, 1863. Acting Assistant Surgeon S. Leslie reports the case. On December 18th, 1866, Pension Examiner J. Bates reports that the patient suffered from headache, frequent giddiness, and a conscious failure of memory. He was unable to perform any manual labor. His disability is rated total and permanent.

CASE.—Private Lewellyn Mowry, Co. B, 25th Massachusetts Volunteers, aged 18 years, was wounded at Cold Harbor, Virginia, June 3d, 1864, by a conoidal ball, which entered over the left eye at the outer margin of the supereiliary ridge, fractured the bone and lodged. He was sent to Washington, and on June 8th was admitted to Finley Hospital On November 1st, he was transferred to the hospital at Readville, Massachusetts, and on December 20th, 1864, was discharged the service. The vision of the left eye was impaired. On June 10th, 1868, Pension Examiner John G. Metcalf reports that he finds an ulcer, five inches from the old cicatrix, four inches above the right eye, of a triangular shape, with equal sides, one inch long. The frontal bone was rough, and at two points a probe could be passed through the outer table. In September, 1868, a portion of both tables of the frontal bone, at the bottom of the ulcer, had been removed by the trephine. The ulcer discharged profusely, and the patient was very feeble. On October 2d, 1868, Dr. Metcalf states that the wound had healed, leaving an indentation about three-fourths of an inch deep. The patient's disability is rated total and permanent.

CASE.—Corporal Ira B. Newkirk, Co. E, 5th Wisconsin Volunteers, aged 23 years, was wounded May 5th, 1864, at the battle of the Wilderness, Virginia, by a conoidal ball, which fractured and depressed the *os frontis* above the supereiliary ridge. He was admitted into Judiciary Square Hospital, Washington, on the 11th. Two days later he was placed under ether, when Assistant Surgeon Alexander Ingram, U. S. A., made an incision one and a half inches in extent from the point of entrance, reflected the flaps, applied the trephine, and removed all the depressed bone, a portion of which was pressing on the dura mater. The parts were brought into apposition, and two sutures applied. The patient's constitutional condition was very good. Ice water dressings were applied, and saline cathartics administered. No untoward symptoms occurred, and on July 16th the patient was returned to his regiment. He was discharged July 30th, 1864. He is not a pensioner.

CASE.—Private William G. Parker, Co. A, 76th New York Volunteers, aged 32 years, was wounded at the battle of Cold Harbor, Virginia, June 2d, 1864, by a conoidal ball, which fractured the cranium. He was, on the following day, admitted to the hospital of the 4th division, Fifth Corps, where the operation of trephining was performed. On June 12th, he was sent to the Campbell Hospital, Washington, where he was discharged from the service on July 10th, 1865. He is not a pensioner. The case is reported by Assistant Surgeon J. S. Billings, U. S. A.

CASE.—Private Joseph R. Phillips, Co. H, 2d Michigan Cavalry, temporarily assigned to the 27th Michigan Sharpshooters, aged 43 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 12th, 1864, by a conoidal ball, which fractured the superior portion of the right parietal bone. He was, on the same day, admitted to the hospital of the Ninth Corps, and thence conveyed to Washington, where he entered Harewood Hospital on the 25th. The skull was trephined and simple dressings were applied. He recovered rapidly, was furloughed on June 28th, and discharged from the service on October 22d, 1864, by reason of expiration of term of service. He is not a pensioner.

Case.—Corporal George W. Phillips, Co. B, 30th Indiana Volunteers, aged 21 years, was wounded during the siege of Nashville, Tennessee, December 16th, 1864, by a shell, which fractured the cranium at the posterior fontanelle. Portions of the bone were removed on the field, while the patient was in a state of partial insensibility. He was admitted to the hospital of the 3d division, Fourth Corps, and thence conveyed to Nashville, where he was admitted to Hospital No. 3 on the following day. On January 8th, 1865, he was transferred to the Jefferson Hospital, Jeffersonville, Indiana, and thence sent to Columbus, Ohio, entering Tripler Hospital on the 24th. The patient stated that the skull had been trephined, and a silver plate inserted one month after the reception of the injury, and that complete paralysis of the left side had existed for two months. When admitted to Tripler Hospital he could use his arms, but had to go on crutches, on account of want of control over lower limbs. His general health was good. Cold water dressings were applied. He was discharged from the service on May 26th, 1865, the wound having healed, except a small sinus. There was a crucial cicatrix two inches long from before backward, and one inch wide, a depression one-fourth of an inch at its greatest depth, and partial paralysis of the left side. In July, 1868, Phillips was a pensioner, his disability being rated total and permanent. The case is reported by Acting Assistant Surgeon J. M. Abraham. The patient applied for an increase of pension on November 25th, 1868, but his claim was not admitted. On January 8th, 1869, Pension Examiner S. C. Sapp reported that the patient's mind was impaired, and that he could not bear exposure to heat without falling over. He rates his disability permanent.

Case.—Private John Shaffer, Co. D, 18th Missouri Volunteers, aged 38 years, was wounded at the battle of Shiloh, Tennessee, April 7th, 1862, by a conoidal ball, which fractured the left parietal bone, near the sagittal suture. He was taken prisoner, and probably remained in the hands of the enemy until October 3d, 1863, when he was admitted to the Washington Hospital, Memphis, Tennessee. He recovered, and was returned to duty October 27th, 1863. On December 26th, he was again admitted to Hospital No. 4, Louisville, Kentucky; March 19th, 1864, transferred to St. Louis, Missouri, and on September 4th sent to Simon Hospital, Mound City, Illinois. The records of the latter hospital state that the trephine had been applied, and a large portion of the parietal bone removed prior to admission. No particulars as to date and mode of operation can be obtained. The wound was discharging, and the patient was suffering from headache and epilepsy, On the 22d of the same month he was transferred to Jefferson Barracks, Missouri, and discharged from the service March 1st, 1865. He is not a pensioner.

Case.—Private M. F. Sheffler, Co. E, 39th Illinois Volunteers, was wounded at Fort Wayne, August 15th, 1863, by a conoidal ball, which struck the frontal bone near the coronal suture, one and a half inches from the apex of the frontal bone. The injury at the time was considered a slight scalp wound, which healed rapidly. The patient was placed on light duty, and no bad symptoms were perceptible from continuous daily labor. In January, 1864, he began to experience a feeling of numbness in his privates, nates, and right limb, which increased and finally extended to the left limb, and at the same time he began to suffer from difficulty in voiding urine. Under the impression that he had the gravel, he was subjected to a bathing process for a period of seven weeks, without any beneficial results. He consulted Drs. Fox and Johnson of Washington, who pronounced his disability to be a general disease of the spine. On his second visit he told Dr. Johnson that he had been wounded in the head, and the doctor informed him that an operation would be necessary to procure relief. In November, 1867, the case came under the observation of Dr. C. M. Clark, who decided on an operation, which he performed on December 9th, 1867. Ether was administered to the patient, and a crucial incision made through the scalp and the flap turned back; the periosteum was scraped off, when the bone immediately over the fracture seemed loose in texture, and blood began to ooze from the wound. The trephine was applied by Surgeon C. M. Clark, 39th Illinois Volunteers, so as to cover all the depression, and a button of bone one inch in diameter and one-fourth of an inch in thickness was removed. The patient was allowed to recover from the anæsthetic before the section was complete; sensation and motion returned the instant it was lifted, and he walked unaided to his bed. On the following day a mild aperient was given; he rested well, but had a slight chill in the morning. On the 12th, there was still slight numbness about the perineum; the wound had united except at point of incision, where there is slight suppuration. His strength gradually increased, and on December 24th, walked a distance of three miles. He went home on January 14th, 1868, entirely recovered. He is not a pensioner.

Case.—Private Nelson J. Ward, Co. K, 62d Ohio Volunteers, aged 19 years, was wounded at the battle of Appomattox Court-house, Virginia, April 9th, 1865, by a conoidal ball, which fractured and depressed the left parietal bone. He was immediately conveyed to the field hospital of the Twenty-fourth Corps, where the depressed portion of bone was removed with the trephine by Surgeon S. A. Richardson, 13th New Hampshire Volunteers. On April 10th, he was transferred, and on the 17th entered the hospital at Point of Rocks, Virginia. He was, on May 16th, sent to the West's Buildings Hospital, Baltimore; on May 22d, to the Jarvis Hospital; on July 24th, to the Hicks Hospital, and finally discharged from the service on August 26th, 1865, and pensioned. In June, 1866, Pension Examiner G. W. Livesay reports that the man has frequent attacks of epilepsy, sometimes several within twenty-four hours, and that the disability is permanent.

Hernia Cerebri.—This complication was observed not infrequently:

Case.—Private *W. A. Baden*, Co. E, 1st Maryland Cavalry, was wounded in an engagement October 12th, 1863, by a conoidal ball, which struck the left parietal bone about midway between top of the ear and the vertex, glanced a little downward and backward, and made its exit in a track of one and a half inches in length. He was admitted to the Chimborazo Hospital, Richmond, Virginia, October 19th, 1863, at which time he could give no account of himself, seemed timid, shy, and easily agitated. On October 22d, the scalp was freely incised from the wound of entrance to that of exit; the cranium was found to be fractured, comminuted, and depressed. Portions of bone were removed with probe and forceps. Five days later, hernia cerebri, of the size of a common marble, appeared; the divided edges of the meninges could be distinguished upon the base of the cerebral protuberance. On October 26th, the protruded brain began to disappear by suppuration, and had disappeared entirely by October 31st, when the patient was somewhat more intelligent. On November 3d, an abscess appeared over the occipital bone a little to the left of the median line and about four inches from vertex, which was opened. On examination, a

fracture of the occipital bone was discovered. The outer table was elevated and a piece of lead was found closely impacted between the plates; all attempts to remove it without trephining proved ineffectual. The ball had been split when impinging upon the parietal bone and a portion of it had passed within the cranium, making its partial exit through the occiput. On January 31st, 1864, the patient was doing well, all the wounds in the scalp had cicatrized; a depression in the parietal bone marked the site of fracture and a projection of outer table of the occipital bone existed, the lead still remaining between the tables of the bone. The patient recovered, but remained somewhat childlike and was easily confused in mind. He was discharged on October 4th, 1864.

Case.—Private Thomas Haley, Co. D, 91st New York Volunteers, aged 28 years, was wounded at Petersburg, Virginia, March 29th, 1865, by a piece of shell, which fractured the frontal bone just above the right eye, causing hernia cerebri. He was admitted to the hospital of the 1st division, Fifth Corps, on April 2d; sent to City Point, and thence conveyed to Washington and admitted to the Armory Square Hospital on April 10th, 1865. Simple dressings were applied to the wound. On April 27th, a piece of the orbital bone which had become loose was removed, otherwise the case progressed well, and on July 18th, 1865, Haley was transferred to New York for muster out. He is not a pensioner.

Case.—Private *William H Hogan*, Co. K, 14th Virginia Infantry, was accidentally wounded on January 15th, 1863, by the discharge of a musket. The missile entered on the postero-lateral portion of the right side of the head, passed forward and upward across the parietal protuberance and emerged, exposing the skull for a distance of three inches, and fracturing the parietal bone. He was admitted to the Chimborazo Hospital, Richmond, Virginia, on January 23d. His mental faculties were perfect, and there was very little constitutional disturbance and no paralysis. A triangular portion of the bone had been removed, through which opening the brain was protruding. He stated that when wounded, there was complete paralysis of the left side. Cold-water dressings were applied to the wound, and a compress to the protruding portion of the brain, which caused it to slough. The bowels were kept open, and the patient kept on light diet. The bone became necrosed along the whole track of the ball, and was removed, exposing the brain for two inches, after which the wound healed rapidly, with a depressed cicatrix. The patient was returned to duty on July 21st, 1863, perfectly cured, with the exception of an occasional headache.

Case.—Sergeant Borden Joline, Co. G, 1st New Jersey Cavalry, was wounded near Sulphur Springs, Virginia, on October 12th, 1863, by a conoidal ball, which entered the cranium directly over the right eye, about two inches above the superciliary ridge. He entered the Judiciary Square Hospital, Washington, on the 14th, and was furloughed for forty days. On March 18th, 1864, he entered Ward Hospital, Newark, New Jersey, his general health being good. A small opening still remained at the wound of entrance, discharging a slight quantity of pus. There was no swelling, redness, or inflammation of the parts. On May 3d, Acting Assistant Surgeon James B. Cutler, made a crucial incision at the wound of entrance, reflected back the flaps, and extracted the ball, which was partially impacted in the skull, and partly in contact with the substance of the brain. The missile was very irregular and misshapen. Cold water was kept applied to the wound, the head was kept elevated, and strict antiphlogistic treatment employed. Hernia cerebri formed, three or four days after the operation, with a profuse discharge from the wound. The hernia was pared off on a level with the scalp, but, on July 6th, it reappeared, when slight pressure was applied. By August 23d, there was no hernia or discharge. The wound was entirely closed, with no impairment whatever of the mental faculties, and the patient was doing remarkably well. On August 26th, 1864, he was transferred to Trenton, New Jersey, to be mustered out of service. This man's name is not on the pension roll.

Case.—Private *David Jones*, Co. A, 1st Virginia Regiment, was admitted to the hospital of the 1st division, Alexandria, Virginia, on May 3d, 1863, with a gunshot wound of the head. The missile, a musket-ball, entered one-fourth of an inch above the middle of the right supra-orbital arch, fractured the outer table of the frontal bone, and taking a semicircular course, lodged above the right ear, whence it was extracted. The left upper eyelid was very much swollen, completely closing the eye; and there were symptoms of fever, with considerable pain. Cold-water dressings were applied, and the swelling gradually subsided. On May 20th, an incision was made, and a quantity of pus evacuated, which relieved the parts and improved the condition of the patient. On June 2d a piece of bone came away, and on June 12th erysipelas attacked the orbital region. The wound was laid freely open down to the frontal bone, which was found to be denuded of periosteum. On June 23d, the erysipelas extended all over the face, forehead, and right side of scalp; the tongue was furred, bowels loose, and appetite poor. Through the wound protruded a large tumor, the size of an orange, caused by thickening of the periosteum. A solution of sulphate of iron was applied to the infected parts. The symptoms being of a typhoid character, the patient was treated with fresh breeze day and night, beef tea, brandy, and flax-seed enema. On July 1st, the tongue had become moist and the stools more natural. On July 6th, the tumor was dissected, and isinglass plaster applied. The edges of the wound were then gradually approximated, and a steady improvement followed. He was sent to the provost marshal on July 20th, 1863. The case is reported by Surgeon W. A. Conover, U. S. V.

Case.—Lieutenant Charles Kennedy, Co. I, 28th Pennsylvania Volunteers, aged 25 years, was wounded at the battle of Chancellorsville, Virginia, May 2d, 1863, by a fragment of shell, which produced a wound two inches long and one inch wide, removing the superior portion of the occipital bone one inch to the right of the median line, destroying the membranes so that the substance of the brain protruded about one and a half inches. On May 7th, he was admitted to Armory Square Hospital, Washington. The wound had a burnt and black appearance, and the pulsation of the brain was very distinct with every beat of the heart. The patient's intellect was greatly impaired, and there was total loss of vision, so that he could not distinguish day from night. The pulse was at 60 and full, and there was partial loss of power in the lower extremities. After admission to hospital, the hair was closely shaven around the wound, and the dead tissue was removed by sponging with tepid water. His bowels were constipated for seven days from the date of the injury, and he had scarcely any sleep. Cathartics, injections, and anodynes were administered. On May 11th, twelve leeches were applied to each temple, and three behind each ear. On the following day the symptoms were greatly ameliorated. On May 13th, spiculæ of bone were removed, and also on

Ed Stauch pinx.

J Bien, chromolith.

HERNIA CEREBRI, FOLLOWING GUNSHOT FRACTURE OF THE OCCIPITAL.

the 15th, when the fungus had receded somewhat, and a healthy granulation was progressing. His appetite was good, no fever, vision partially restored, and able to get out of bed. He continued to improve, and on June 16th the fungus had entirely retracted, and vision was restored. The intellect was perfect and the general health good. On June 20th, Lieutenant Kennedy went home on leave of absence. He was subsequently admitted to the Officers' Hospital at Philadelphia. On September 9th, 1863, the wound had entirely healed. On November 12th, he was ordered before an examining board at Annapolis, and was returned to duty January 12th, 1864. On May 5th, 1864, he was admitted to the field hospital at Lookout Mountain, being again returned to duty about July, 1864. He was discharged the service July 20th, 1864, and afterward pensioned. Pension Examiner Wilson Jewell, under date of April 19th, 1865, reported that the patient suffers from cephalalgia, vertigo, and weakness, when exposed to the sun or much excited. His disability was rated one-third and temporary. It was subsequently stated by Dr. C. C. McGlaughlin, late surgeon 95th Pennsylvania Volunteers, that he attended Lieutenant Kennedy in his last illness, and that he died December 15th, 1865, from the effects of a wound in his head. The plate opposite illustrates the appearance of the wound in May and June, 1863.

Case.—Private *P. E. A. Williams*, Co. I, Palmetto Sharpshooters, aged 23 years, was wounded in an engagement near Petersburg, Virginia, June 19th, 1864, by a conoidal ball, which impinged upon the superior portion of the frontal bone, left side. The wound was one inch and a half in length antero-posteriorly, and one inch in width. The inner edge was half an inch from the median line; the outer table was grooved by the ball, leaving the borders nearly smooth; the inner table was broken into numerous spiculæ, some of them pressing directly upon the dura mater, and some of the smaller ones penetrating the brain. He was stunned by the injury, but soon recovered consciousness, and again became comatose. The loose spiculæ of bone were removed, and simple water dressings applied. He was sent to the Jackson Hospital, Richmond. His condition remained critical for weeks. For two weeks symptoms of coma continued. Spiculæ were removed as soon as they became detached, and the wound was kept carefully cleaned. By August 14th, his general condition had improved; most of the spiculæ had come away, leaving a large orifice, with clean edges. The dura mater was exposed and perforated by small orifices. Two months after the reception of injury, when all the circumstances attending the case indicated recovery, the cerebral substance began to protrude through the opening, but was not followed by any serious symptoms. Compress was applied, and in two weeks the hernia cerebri had receded, and healthy granulation had sprung up. He was discharged from hospital about the middle of September, 1864, and returned to South Carolina. The wound remained open, descharging more or less until December, 1865, when it finally cicatrized firmly. In March, 1866, the orifice was filled with bony or cartilaginous matter, slightly depressed in the centre; the cicatrix is fair, mostly destitute of hair; his mind is unimpaired, but occasionally he suffers from slight vertigo on stooping suddenly, or after much mental exertion. The case is reported by Confederate Surgeon F. S. Parker.

Case.—Private Richard H. Baldwin, Co. H, 4th New York Artillery, aged 26 years, was wounded near Petersburg, Virginia, October 2d, 1864, by a conoidal ball, which fractured the frontal and parietal bones, left side. He was sent to hospital of the 1st division, Second Corps, and, on October 3d, was sent to the Second Corps Hospital. Hernia cerebri supervened, and death occurred October 28th, 1864.

Case.—Private *James M. Bartin*, 7th Georgia Regiment, received, at the battle of Bull Run, Virginia, July 21st, 1861, a gunshot fracture of the cranium. He was conveyed to a Confederate hospital at Culpeper, Virginia. Hernia cerebri supervened, and death occurred August 11th, 1861.

Case.—Private Otto Bockel, Co. B, 6th New Hampshire Volunteers, aged 18 years, was wounded near Petersburg, Virginia, July 19th, 1864, by a conoidal ball, which fractured the left temporal and parietal bones. He was conveyed to the field hospital of the 2d division, Ninth Corps, where several spiculæ of bone were removed; thence he was transferred to Philadelphia, entering the Mower Hospital on July 22d. A fungous growth, or hernia cerebri, of the size of a pigeon's egg, protruded through what appeared to be an aperture in the cranium made by a large trephine. The patient seemed to be in full possession of his mental faculties; was cheerful, had a good appetite, and his general health was unimpaired. No signs of compression were developed. Damp compresses of patent lint, saturated with lime-water, were bound as firmly as consistent upon the fungous growth. Absolute quiet, a recumbent position, and light diet were ordered. On August 3d, the hernia had increased to the size of a pullet's egg, and was taking on a vascular condition. The general condition was but slightly changed, the pupils were natural, consciousness seemed nearly perfect, and pulse 70 and full. Dr. Morton examined and made an incision in the hernia. One of the small branches of the cerebral artery became divided and bled freely for some time. No change was perceptible on the 7th, except that the patient became more feeble and lost his appetite; but by the 12th his appetite had again improved, and he seemed quite as well as usual. The hernia steadily increased, and the patient's health beginning to be compromised, it was decided to remove the protruding mass, which was now the size of an ordinary orange. Accordingly, on August 20th, Acting Assistant Surgeon W. P. Moon passed a double-threaded curved needle below the cranial tables, inclosing each half of the neck of the tumor, and after gently tightening the ligatures, the excresence was shaved off to a level with the external table. The patient exhibited little sense of suffering during the operation, but experienced a sense of relief on that side of the head. No anæsthetic was used. Moderate pressure was now applied by means of a compress saturated with lime-water. On the 22d, the patient, though rational, began to fail. Incoherency, with a tendency to coma, were manifest on the 25th, while the growth seemed disposed to reappear. On the following day the patient was rapidly sinking. Motion and sensation of the right side were lost, and the respiration became labored. Death ensued on August 28th, 1864. A *post-mortem* revealed in the left hemisphere a large abscess, from two and a half to three inches in diameter, with softening of the surrounding tissue. All the vessels of the brain were considerably congested. A large trephine had been employed to remove the cranial fracture at the seat of injury. The case is reported by the operator.

Case.—Private James E. Bridge, Co. C, 156th New York Volunteers, aged 20 years, was wounded at Fisher's Hill, Virginia, September 22d, 1864, by a conoidal musket ball, which fractured the occipital bone above and to the left of the

protuberanee. He was admitted to the hospital of the 1st division, Nineteenth Corps, and on Oetober sent *via* Sandy Hook, Maryland, to the National Hospital in Baltimore, where he was admitted on October 3d. Hernia cerebri existed at that time. By the removal of detached fragments of bone at the dressings of the wound, the brain substance became exposed. Death ensued on October 18th, 1864.

Case.—Corporal Edward Briner, Co. B, 9th New York Volunteers, aged 23 years, a very robust man, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a conoidal musket ball, which, crossing the coronal suture, fractured the right temporal and carried away a portion of the parietal bone two and a half inches in length and half an inch in width, exposing the membranes of the brain. He was immediately admitted to the field hospital, and on December 18th was transferred to the Armory Square Hospital, Washington. The pulsations of the middle meningeal artery were visible. The wound discharged healthy pus, and the case progressed satisfactorily until December 26th, when the patient beeame restless, and stupor ensued, terminating in coma on the 29th. A hernia cerebri half an inch in diameter appeared the next day. On January 3d, 1863, the patient had so far recovered that he could answer questions correctly. The hernia was then exeised. Hemiplegia supervened on the 5th, and hernia of the size of a walnut again protruded. Though the power of prehenson was lost, the patient would eat with avidity whatever was placed in his mouth. On the 7th, an attempt was made to excise the hernia, but a severe hæmorrhage occurred from the small branches of the meningea media, which was with diffieulty arrested by compression, and the operation was abandoned. Hæmorrhage recurred on the next day, and death ensued January 8th, 1863. The case is reported by Surgeon D. W. Bliss, U. S. V.

Case.—Private Joseph Butterfield, Co. H, 120th New York Volunteers, aged 16 years, was wounded before Petersburg, Virginia, September 25th, 1864, by a conoidal ball, which extensively fractured the left parietal bone. He was admitted to the hospital of the 3d division, Second Corps, where he remained until about October 29th, when he was conveyed to Washington, and admitted into the Armory Square Hospital. A large hernia cerebri had already formed. The subsequent treatment was of a simple character. Death occurred December 13th, 1864. The case is reported by Surgeon D. W. Bliss, U. S. V.

Case.—Private Albert Colchier, Co. D, 114th Pennsylvania Volunteers, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a gunshot missile, which lacerated the scalp and fractured the cranium, causing the cerebrum to protrude. He was admitted to the hospital of the Third Corps, where fragments of bone were removed from the wound, but death oceurred on May 8th, 1863.

Case.—Corporal Abraham C———, Co. D, 93d Pennsylvania Volunteers, aged 24 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 12th, 1864, by a conoidal ball, which penetrated the right parietal bone near its posterior inferior angle. He was admitted to the 2d division, Sixth Corps, field hospital, and thence was conveyed to Washington, and admitted to Carver Hospital, May 19th. He was very emaciated; the wound sloughed and discharged fœtid pus, and hernia cerebri had appeared. His pulse was 50 and full, the pupils dilated, the tongue coated, and his bowels constipated. On the same day spiculæ were removed from the brain, giving exit to several ounces of pus. Delirium followed and continued until the 27th, when death supervened. The pathological specimen is No. 2900, Sect. I, A. M. M. From the vault of the cranium fragments have been removed for a space of three inches upward and forward, and from one to one-half inch in width, at the upper extremity of which four fragments of the inner table remain attached, depressed two lines at the free edge. One fissure passes downward into the mastoid portion of the temporal, and a second passes upward and backward to the posterior fourth of the sagittal suture. The specimen and history were contributed by Acting Assistant Surgeon R. E. Price.

Case.—Private Patrick Conway, Co. —, 12th Illinois Volunteers, was wounded near Fort Donelson, Tennessee, February 14th, 1862, by a conoidal musket ball, which penetrated the frontal bone, near and to the right of the left eminence and lodged, forcing spiculæ of bone upon the membranes. He was, on February 17th, admitted to a hospital, being conscious but unable to articulate distinctly. He could not raise his voice above a whisper, and was unable to walk or stand in an erect position. On examination the ball was found at the inner edge of the skull, lying upon the membranes, and was, with difficulty, removed, together with some fragments of bone, which had penetrated the membranes. After the operation the patient was able to speak with distinctness and seemed improved. On February 20th, he was worse and somewhat morose. The wound discharged slightly and a small quantity of brain substance was oozing out. There was slight hernia cerebri, with some heat about the head; pulse rapid, full, and compressible. On February 22d, he became unconscious and refused nourishment. Paralysis of the right side occurred, and death ensued on February 24th, 1862.

Case.—Corporal Clarence C———, Co. G, 123d New York Volunteers, aged 24 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a piece of shell, which comminuted the parietal bone, near its posterior superior angle. A state of temporary insensibility supervened in the course of an hour. He remained on the field for three days, was conveyed to the field hospital, and thence sent to the 2d division hospital, Alexandria, on June 15th; being at the time in a state of heavy stupor. The wound suppurated freely, and presented near its centre a pulsating tumor, covered by granulations; hemiplegia of the left side supervened, and the patient voided the urine and fæces involuntarily; the three smaller toes of the left foot were partially gangrenous. While dressing the wound, Acting Assistant Surgeon T. H. Stillwell removed a fragment of the external table, one-fourth of an inch in diameter. On the afternoon of the 16th, Coulton recovered from his stupor and conversed rationally, though with difficult articulation. On the 18th he again sank into a lethargic state, in which he perspired freely. On the 20th and on the 22d, he was again rational for a few hours. Two small pieces of bone were removed, one of which was a portion of the internal table. On the 24th, his breathing was stertorous all day, but at night a marked improvement in his condition took place; the slough had fallen from one of his toes, disclosing a healthy, granulating surface; he began to regain power over the paralyzed leg, void the excrements at will, and could talk without difficulty. On the 30th and 31st, he suffered from convulsive attacks of nervous delirium. One-fourth of a grain of morphia was administered every half hour. By August 5th, the paralysis of the left side had so far ceased that he could flex his extremities and extend his leg, though not with

precision. From this date, nothing unfavorable occurred until September 7th, when he again experienced attacks of delirium. On the 27th, after a slight chill. he fell into a state of insensibility. A tumor, which had formed at the wound beneath the scalp, was opened, and upon its discharging about an ounce of blood, sensibility was at once restored. Again a state of unconsciousness ensued on the 30th, and though in a measure relieved by the administration of purgatives, it was evident that dissolution was near. Death occurred on October 2d. At the autopsy, a circular opening one inch in diameter was found, just above the right parietal eminence, with the edges rounded off and beveled at the expense of the inner table. There was also an opening in the dura mater, through which a hernia cerebri appeared. Upon removing the skull cap, three small fragments of the inner table, depressed one-fourth of an inch at their free edge, were observed attached and agglutinated by new ossific deposit, traces of which could also be seen in the immediate vicinity. A cerebral abscess was found extending from the hernia cerebri to the right lateral ventricle containing about two ounces of very offensive lead-colored pus. The pathological specimens are Nos. 1724 and 1725, Sect. I, A. M. M., and were contributed, with the history, by Acting Assistant Surgeon T. H. Stillwell.

Case.—Private Thomas Deshler, Co. I, 103d Ohio Volunteers, was accidentally wounded at Carter Station, Virginia, September 22d, 1863, by a musket ball, which entered just below and in front of the left ear, carried away a portion of the temporal bone and probably made its exit above and in front of the ear. He was admitted into the regimental hospital at Bull's Gap, Virginia, on the same day. The brain protruded from the wound and about one ounce dropped off. He was partially conscious, for the most part, until his death on September 24th, 1863. There was no *post-mortem* examination. The case is reported by Surgeon L. D. Griswold, 103d Ohio Volunteers.

Case.—Corporal Jerry Green, Co. A, 68th United States Colored Troops, was wounded at Fort Blakely, Alabama, April 9th, 1865, by a shell, which fractured the left temporal and the frontal bone. He was admitted to hospital, 1st division, United States Colored Troops, Montgomery, Alabama, in a comatose condition. The brain protruded and the left side was paralyzed. He died April 13th, 1865.

Case.—Private Thomas H———, Co. I, 56th Pennsylvania Volunteers, aged 23 years, was wounded at the battle of Petersburg, Virginia, June 22d, 1864, by a conoidal ball, which fractured the right parietal bone at its anterior superior angle. He was admitted to the 4th division, Fifth Corps, hospital, and thence conveyed to Washington, and admitted, on July 1st, into the Finley Hospital. On the 4th, fragments of bone were removed from a space measuring two inches downward from the sagittal suture by one in width. Two days later, hernia cerebri appeared at the opening. The details of the further progress of the case are not recorded, but death resulted on July 11th, five days after the appearance of the hernia and twenty days from the date of injury. At the autopsy, the edges of the opening in the bone were found necrosed and cribriform. The dura mater and parts of the cerebral substance in the vicinity were congested and filled with coagulated blood. The specimen is figured in the wood-cut, and was contributed, with the history, by Surgeon G. L. Pancoast, U. S. V.

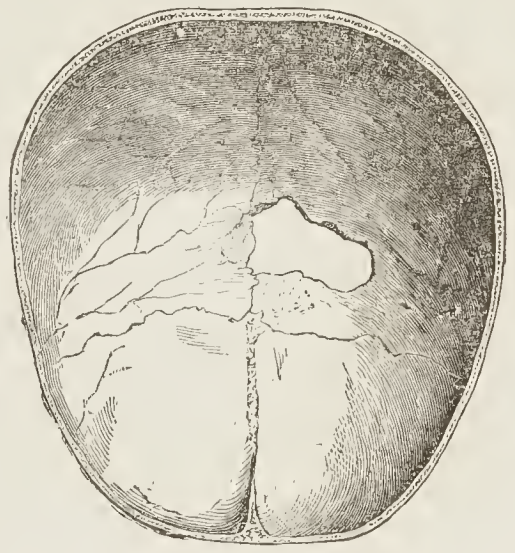

Fig. 145.—Internal view of a skull-cap, with a large aperture, through which a fungus cerebri protruded. *Spec.* 3264, Sect. I, A. M. M.

Case.—Private Andrew W. Hess, Co. B, 46th Illinois Volunteers, aged 19 years, was wounded in the engagement near Fort Blakely, Alabama, April 8th, 1865, by fragments of shell, which fractured the cranium and injured the right shoulder. He was admitted to the hospital of the Thirteenth Corps on the same day, and, on April 15th, was sent to the St. Louis Hospital, New Orleans, Louisiana. Hernia cerebri supervened, and death occurred on April 23d, 1865. The case is reported by Surgeon A. McMahon, U. S. V.

Case.—Private Arthur H———, Co. F, 40th New York Volunteers, aged 28 years, was wounded at the battle of Spottsylvania Court-house, Virginia, May 10th, 1864, by a conoidal ball, which entered the cavity at the middle portion of the right branch of the coronal suture and lodged in the brain, from which it was removed on the field. He was conveyed to Washington, and, on the 12th, admitted to the Douglas Hospital. At the dressing of the wound, May 13th, some pieces of bone were removed, and the finger could be passed deeply into the cerebral substance. Paralysis of the left side ensued, and, at times, involuntary discharge of the fæces and urine occurred. The tongue was drawn to the left or paralyzed side. Hernia cerebri appeared, the protruding part occasionally becoming strangulated and sloughing. The patient retained the possession of his mental faculties in a remarkable degree, answering all questions addressed to him with accuracy. Death supervened on June 20th, 1864, forty-one days after the reception of the injury. At the autopsy, the fractured portion of the outer table was found to measure two inches in length by one in width; that of the inner table somewhat less. Two small fragments of the inner, and two of the outer, remained; the rest had been removed. The surrounding bone was cribriform and slightly carious, and the edges rounded off, showing an attempt at repair. No evidence of meningeal inflammation existed; there was, however, extensive softening of the right hemisphere, involving the thalamus opticus and corpus striatum; the lateral ventricles were filled with serum. The case is reported by Assistant Surgeon William Thomson, U. S. A. The specimen is No. 3566, Sect. I, A. M. M.

Case.—Private George Hopkins, Co. G, 8th Ohio Volunteers, aged 32 years, was wounded before Petersburg, Virginia, June 17th, 1864, by a conoidal musket ball, which fractured and depressed the frontal bone, left side. He was admitted to the Ninth Corps field hospital, where spiculæ of bone were removed and water dressings applied. He was thence conveyed by steamer to Washington, and admitted, on June 24th, into the Emory Hospital. On June 27th, coma; on June 30th, delirium; and on July 1st, hernia cerebri supervened, which latter was, on July 3d, removed and cauterized with nitrate of silver. Death occurred on July 8th, 1864.

CASE.—Private *William Hubbard*, Co. B, 2d Maryland Regiment, aged 24 years, received, on September 30th, 1864, a gunshot fracture of the right parietal. He was admitted, on October 3d, 1864, to Chimborazo Hospital No. 2, Richmond, Virginia. The brain gradually protruded from the wound, and death occurred on October 4th, 1864.

CASE.—Sergeant Austin Hudson, Co. F, 60th Ohio Volunteers, was wounded near Petersburg, Virginia, July 15th, 1864, by a conoidal ball, which entered near the anterior superior angle of the left parietal bone, ploughing through bone and brain to the lambdoidal suture. He was admitted to the hospital of the 3d division, Ninth Corps. The brain protruded. Death occurred July 15th, 1864.

CASE.—Private John Irvin, Co. D, 88th Pennsylvania Volunteers, aged 20 years, was wounded at the battle of Spottsylvania, Virginia, May 10th, 1864, by a conoidal ball, which fractured the left parietal bone. He was immediately admitted to the regimental hospital, transferred to 2d division, Fifth Corps, hospital on the 12th, and sent to the Emory Hospital, Washington, on the 13th. An examination revealed a lacerated wound of the scalp and pericranium, three inches long and one and a half inches at its widest point. The fracture of the parietal bone extended from the lambdoid suture along the median line, two inches by one-half inch. The posterior end of the fractured portion of the cranium was depressed. On the 13th, the patient's right side was paralyzed and his mind wandering; the pulse was normal, and the appetite good. He was placed under the influence of ether and chloroform. Surgeon N R. Moseley, U. S. V., then enlarged the wound by a straight incision, and removed a piece of bone about two inches in length; several smaller fragments were taken out. Water dressings were applied to the wound, but no marked improvement took place. On May 18th, hernia cerebri supervened, the breathing became stertorous, and the pulse accelerated. Death ensued on May 31st, 1864. The case is reported by Surgeon N. R. Moseley, U. S. V.

CASE.—Corporal Edward Jones, Co. A, 8th Ohio Volunteers, was wounded at Gettysburg July 3d, 1863, by a conoidal ball, which entered the cranium at the articulation of the nasal with the frontal bone, passed through the superior and posterior portion of the left orbit, and displacing the os unguis, emerged through the articulation of the frontal and malar bones. The eye had apparently escaped serious injury. He was admitted to the Seminary Hospital, Gettysburg; thence was sent to Bedloe's Island Hospital, New York Harbor. Partial insanity supervened, and the extreme inflammation consequent upon the injury disorganized the structures of the eye. On October 29th, he was transferred to De Camp Hospital; thence, on December 23d, to McDougal Hospital, and on December 30th to Camp Dennison, Ohio. There was at this time a free discharge, supposed to be from the wounded appendages of the eye; but his strength was good. On January 10th, 1864, he was seized with vomiting and hiccough; the tongue became dry, with red border and dark centre; bowels torpid, and general condition typhoid. He complained of occasional pain in the front part of his head; was drowsy and disinclined to talk. Two weeks later he became unconscious; paralysis of the right side supervened, attended with involuntary evacuation of urine and fæces. Meantime the discharges from the left orbit had nearly ceased. About February 10th, he sank into a well marked coma. Beneath the inflamed superior palpebra, a sharp edge of bone could be felt, and at the internal canthus quite a prominence was observed, produced by another portion of displaced bone. On the morning of the 16th, the indications denoting compression of the brain were strongly marked. On the next day Acting Assistant Surgeon W. C. Cole made an incision to the bone from the external canthus of the left eye to the upper point, to tie the anterior branch of the temporal artery. A second incision was carried from the internal canthus obliquely upward, and dissection made of the flap, which included the upper eyelid. This disclosed a fracture of the orbital plate of the frontal bone and the displacement of the os unguis, and between them a hernia cerebri one inch in diameter, which was removed, opening a cavity within the anterior lobe of the left hemisphere, from which escaped about six ounces of a semi-transparent fluid, apparently disorganized serum. The flap was brought down and secured by a stitch at each side, with a tent placed in the aperture. Prompt reaction, with full consciousness, ensued before the patient was removed from the operating table. He was then carried to bed, and a nurse was appointed to apply cold water dressings and carefully watch him. In the course of two days the paralysis passed off, and the involuntary evacuations ceased; the pulse rose from 55 to 85, and the tongue became natural. The discharge from the wound soon changed to a thick healthy looking pus, and for ten days all the functions of life were harmoniously performed. But on the morning of the 27th he complained of pain in the back part of the head; the face became flushed, the tongue dry and red, and the pulse more frequent. Two grains of calomel, with one grain of ipecac, were now given every four hours. By the next day the pulse was 120, and he was unable to answer any questions. Veratrum viride was carefully administered. He sank steadily, and died on the afternoon of the 28th. At the autopsy, the meninges and brain, as viewed *in situ*, showed marked venous congestion, but the arachnoid membrane had evidently suffered most from inflammation. A cavity, lined with a thick firm cyst, was found in the anterior superior part of the left hemisphere, communicating with the orbit of the eye; the ventricles were empty, and a deposit of lymph covered the upper surface of the tentorium. The case is reported by Acting Assistant Surgeon W. C. Cole.

CASE.—Private *N. B. Jones*, Co. I, 3d North Carolina Regiment, aged 30 years, was wounded in the battle of Winchester, Virginia, September 19th, 1864, by a conoidal ball, which comminuted the skull. The brain substance was loosened, and protruded through the aperture in the cranium. He was immediately conveyed to the depot field hospital of the Nineteenth Corps. Brain symptoms were fully developed, and on the following day Assistant Surgeon G. M. Burdette, P. A. C. S., removed all loose fragments of bone. Cold applications were made to the head, but progress was very unfavorable, and death ensued on September 28th, 1864, from "laceration of brain substance, with cerebritis and meningitis."

CASE.—Corporal W. O. K———, Co. F, 3d Indiana Cavalry, aged 29 years, was wounded at Funkstown, Maryland, July 8th, 1863, by a fragment of shell, which comminuted the *os frontis* a little to the right of the median line, and half an inch above the orbit. He remained insensible only a few hours after the reception of the injury. The wound was then enlarged, a number of fragments of bone were removed, and cold water dressings applied. On the 18th, he was admitted into the general hospital at Frederick, Maryland, with the wound in a healthy condition, and no functional or cerebral derangement. A

hernia about the size of a pullet's egg was protruding from the opening, which was surrounded by healthy granulations. He complained of slight, dull, heavy headache; the tongue was slightly furred; bowels constipated, but the appetite fair. Aperients were ordered, which entirely relieved the headache. He was somewhat morose, but conversed readily. No paralysis existed. On the 24th, his appetite and general condition were most excellent. The hernia showed a disposition to slough, and the soft parts were granulating finely. On the 27th, the hernia had sloughed away, and profuse suppuration supervened, parts looking healthy. Headache again came on, which continued for several days, and on the 23d the patient's appetite began to fail. On the 7th, the wound was suppurating profusely, and the granulations, which nearly covered the opening, were pushed outward by the hernia. Fluctuations were well marked on the 10th. The abscess, which evidently communicated with the brain, was freely opened, giving exit to half an ounce of pus. On the 12th, he became quite delirious; the right pupil was contracted, while the left was somewhat dilated; pulse slow and feeble; no appetite. August 14th, subsultus tendinum set in, and the patient died at half-past one o'clock the following morning. The *post mortem* revealed the entire brain substance softened, and the left lateral ventricle filled with pus. The pathological specimen is represented in the adjacent wood-cut. Fragments have been removed from a space two inches in diameter, including the right frontal eminence. From the inner table the removal of bone has been more extensive, including the posterior walls of both frontal sinuses. The anterior walls of the sinuses are comminuted, and the fragments are consolidated by new ossific deposit, and depressed from one-fourth to one-half an inch at their upper and free edges. From the upper part of the opening a fissure runs outward to the extremity of the right great ala of the sphenoid. The specimen and history were contributed by Assistant Surgeon R. F. Weir, U. S. A.

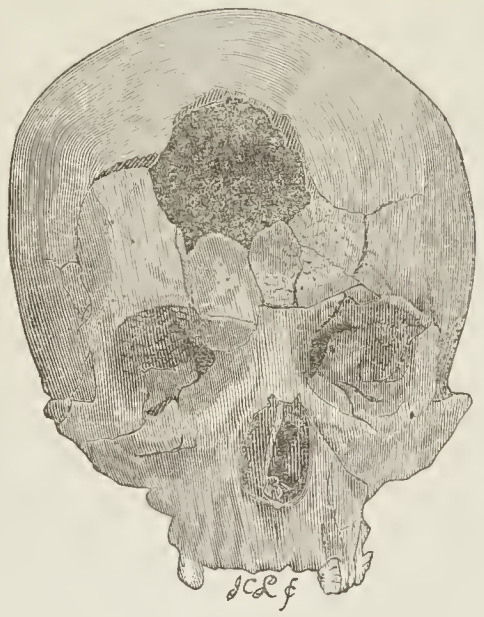

FIG. 146.—Section of a skull trephined after a fracture by a shell fragment. *Spec.* 3834, Sect. I, A. M. M.

CASE.—Private Charles H. K———, Co. I, 12th Massachusetts Volunteers, was wounded at Antietam, September 17th, 1862, by a musket ball, which fractured and depressed both tables of the frontal bone. He was sent to the regimental field hospital, thence was conveyed to Baltimore, and admitted into the Newton University Hospital on the 20th. The ball, with the fragments of the external table, had been removed. The patient was suffering from slight symptoms of compression of the brain, which gradually increased. On the 23d, Surgeon C. W. Jones, U. S. V., after having enlarged the external opening, removed several large depressed pieces of the internal table, to the manifest relief of the patient. During the removal of the fragments, slight hæmorrhage occurred from the superficial enlargement of the wound, and, at the conclusion of the operation, the pulsations of the meningeal artery were distinctly visible beneath the dura mater. The edges of the scalp were brought together by adhesive strips, and the head elevated by pillows. He conversed coherently, his breathing was easy and natural, and the edges of the scalp commenced to adhere by granulation. Nine days after the operation the wound was slightly elevated, and in the centre could be seen the somewhat darkened dura mater. Slight compression was used; but, on the following morning, the protrusion of the brain, covered by the dura mater was greatly increased, having, in its progress, broken up all the adhesions formed at the edges of the wound. The patient was depressed, dull, and slightly comatose. Convulsions shortly after ensued, and death occurred October 3d, 1862, ten days after the operation and two days after the appearance of the hernia cerebri. The pathological specimen is No. 410, Sect. I, A. M. M. The nine small fragments removed from the frontal bone consist chiefly of diploë and vitreous table, and include one-fourth square inch of surface. The specimen and history were contributed by the operator, Surgeon C. W. Jones, U. S. V.

CASE.—Private T. L———, Co. C, 25th New York Volunteers, aged 34 years, was wounded at the battle of Fredericksburg, Virginia, December 13th, 1862, by a conoidal musket ball, which struck the *os frontis* about one inch above the right orbit, fracturing and depressing both tables for a space one inch in diameter. He was stunned for a moment, but soon recovered; was taken to a field hospital, and thence admitted into Hammond Hospital, Point Lookout, Maryland, December 15th, apparently doing well in every respect. His appetite was good, bowels regular, and he was able to walk about as usual. Cold water dressings were applied, and absolute rest and low diet ordered. The case progressed favorably until the 23d, when violent pain in the head supervened. On the next day he became stupid and drowsy, understanding, with difficulty, questions put to him. The pupils were slightly dilated, but no paralysis or loss of sensation existed. It being decided that an operation was imperative, the patient was placed under the influence of chloroform, and Assistant Surgeon C. Wagner, U. S. A., applied the trephine on the anterior border of the fracture, and removed a number of fragments of bone. One piece, measuring three-fourths of an inch in length by one-half inch in width, had lacerated the dura mater and imbedded itself in the brain substance, and was, with great difficulty, extracted. The dura mater was much congested. After the operation, the patient was free from all pain and the brain symptoms had entirely disappeared; but, on the 28th, hernia cerebri appeared and rapidly increased, the patient sinking into insensibility, with widely dilated pupils, cold skin, and slow, feeble pulse. He died on the following morning in a state of complete coma. At the *post-mortem* examination the hernia was of a dark color, very soft, and protruding an inch and a half. The dura mater was softened, and covered with a slimy exudation near the seat of injury. Its laceration corresponded very nearly in extent with the opening in the skull. The membranes of the whole of this side were much congested; the anterior portion of the right cerebral hemisphere was disorganized,

FIG. 147.—Segment of skull trephined after fracture by a musket ball. *Spec.* 922, Sect. I, A. M. M.

soft, of a greenish color, and infiltrated with very offensive pus. The posterior portion presented a more normal appearance on the surface, but on cutting it a small abscess was found. The left cerebral hemisphere and membranes were comparatively healthy. The specimen is represented in the adjoining wood-cut. The *os frontis* shows two fissures, one commencing at the posterior and outer border of the opening in the skull, and running downward and backward across the temporal ridge for the distance of an inch; the other commencing an inch anterior to the first, passes downward into the roof of the orbit, along its outer border for the distance of half an inch. The piece of bone between the fractures is quadrangular in shape, and has been forced outward at its detached borders for the distance of a quarter of an inch from the surface of the skull, remaining still attached at its inferior surface. The specimen and history were contributed by Assistant Surgeon C. Wagner, U. S. A.

CASE.—Sergeant *D. M. Livingston*, Co. I, 27th Georgia Regiment, was admitted to Jackson Hospital, Richmond, Virginia, on June 20th, 1864, with a gunshot fracture of the cranium. Hernia cerebri supervened, and death occurred June 27th, 1864. The case is reported by Surgeon J. G. Cabell, P. A. C. S.

CASE.—Sergeant James L———, Co. I, 153d New York Volunteers, aged 19 years, was wounded at the battle of Cedar Creek, Virginia, October 19th, 1864, by a conoidal ball, which entered the cranium at the superior border of the occipital bone, just to the left of the median line, and lodged in the left hemisphere of the brain; his left elbow joint was also fractured. On the 21st he was admitted into the depot field hospital of the Nineteenth Corps, at Winchester, Virginia; thence was transferred to the Jarvis Hospital, Baltimore, which he entered on October 26th. The ball and several pieces of dead bone were extracted, and cold-water dressings applied. Hernia cerebri followed, and death occurred on November 20th, 1864. The autopsy revealed the portion of scalp surrounding the wound in a very unhealthy condition. The skull cap was unusually thick. The ball had carried with it a number of small pieces of bone. Surrounding the spinal cord were found about four ounces of purulent fluid. The elbow joint was comminuted. The pathological specimens are Nos. 3729 and 3725, Sect. I, A. M. M. The former represents a segment of the cranium; fragments have been removed from an elliptical opening, measuring one and a half inches from below downward, by one inch in width. The edges of the opening are necrosed and beveled at the expense of the inner table, and there are traces of attempt at repair. The latter specimen is a wet preparation of the cerebrum, in the left hemisphere of which a conoidal ball remained lodged for more than a month before death. The specimens are contributed by Acting Assistant Surgeon B. B. Miles.

CASE.—Private *James L*———, Co. I, 12th Mississippi Regiment, aged 26 years, was wounded at the battle of Spottsylvania, Virginia, May 10th, 1864, by a fragment of shell, which produced a comminuted fracture of a portion of the left parietal and temporal bones. He was conveyed to Washington, and on the 14th admitted into the Carver Hospital, suffering constant and excruciating pain in the head. He was obliged to lie upon his left side in a recumbent position, and remain perfectly quiet. Simple dressings were regularly applied to the wound, and a restricted diet enjoined. A hernia cerebri appeared at the seat of fracture. Unconsciousness supervened, the breathing became slow and stertorous, and as the coma deepened, large quantities of laudable pus were discharged from the wound. He died on the 20th of the month. At the autopsy the fractured surface was found to measure three and one-half inches downward and backward, by one-half inch in width, from which fragments had been removed. One fissure run from the anterior inferior angle of the parietal, nearly to the sagittal suture, and a second crossed the lambdoidal. There was no attempt at repair. The specimen is represented in the adjoining wood-cut, and was contributed by Acting Assistant Surgeon O. P. Sweet.

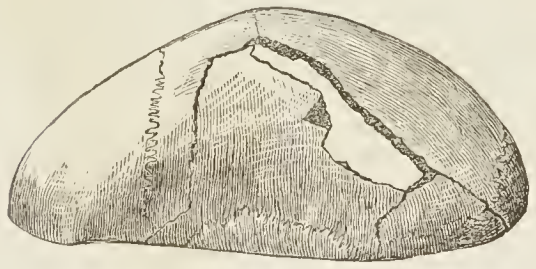

FIG. 148.—Segment of skull fractured by a piece of shell. *Spec.* 2901, Sect. I, A. M. M.

CASE.—Major Thomas McClurken, 30th Illinois Volunteers, received, at the battle of Belmont, Missouri, November 7th, 1861, a gunshot fracture of the cranium. Three inches of the skull were shot away, and the brain substance protruded. He died on November 15th, 1863.

CASE.—Private Jacob Morford, Co. A, 29th Pennsylvania Volunteers, was wounded at the battle of Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal musket ball, which fractured the frontal bone immediately above the nose, and a little to the left of the median line, crushing the bone and driving the fragments into the brain. He was admitted to the field hospital at Gettysburg on the following day. Several small pieces of bone were removed, and cold water dressings applied. He complained of severe pain in his head, and would answer questions irrationally. His pulse was somewhat excited, but the tongue was natural and the eyesight unimpaired, although a portion of the orbital process had been removed. He would leave his tent at night, under the impression that he was acting as picket. He remained in this condition until July 17th, when again several pieces of bone were removed, leaving an opening large enough to admit the index finger, which could be passed in almost its entire length, without meeting with any resistance or producing any considerable pain, a considerable portion of the brain

FIG. 149.—Internal view of the skull-cap trephined after gunshot fracture. *Spec.* 1359, Sect. I, A. M. M.

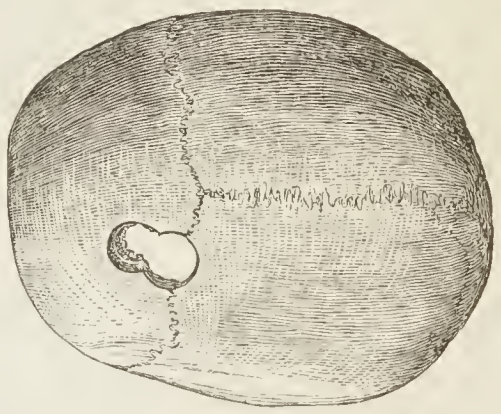

FIG. 150.—Exterior view of the specimen, illustrated by the cut opposite.

being softened. A small fungus projected from the brain. After the removal he expressed himself relieved, and the pain in his head ceased almost entirely, and he became more rational. On July 19th, he was taken to the Seminary Hospital. Coma supervened, which was relieved for a time by the application of water dressings, but hernia cerebri appeared, and death occurred on August 16th, 1863. The specimen, represented in the adjoining wood-cut, is the vault of the cranium. Two disks intersecting each other have been removed by the crown of a three-fourth inch trephine, the entire opening measuring one and one-fourth by three-fourths of an inch. There is a slight stellate fissuring of the inner table.

CASE.—Private Amer Moore, Co. G, 2d United States Artillery, aged 20 years, was wounded in a skirmish near Culpeper, Virginia, on September 13th, 1863, by a carbine ball, which struck the vertex of the cranium at the centre of the coronal suture, passed directly backward along the sagittal a distance of three inches, and lodged. The missile was extracted the same day. Both tables of the skull were fractured, leaving an opening, through which pulsations of the brain could be seen. The dura mater was uninjured. Complete paralysis of the lower extremities and of the left arm existed. He was admitted into the Armory Square Hospital, Washington, on September 14th, and on the following day a plate of bone, three-fourths by one-fourth of an inch, and several small particles, were extracted by Acting Assistant Surgeon E. Brooks. Creosote wash and permanganate of potash were used to dress the wound, which looked well. The general condition of the patient was apparently good on September 21st, when an oblong piece of lead was removed from beneath the scalp; but hernia cerebri followed this operation, and death occurred on October 10th, 1863. The case is reported by Surgeon D. W. Bliss, U. S. V.

CASE.—Captain *Thomas Moyer,* 7th Georgia Regiment, received, at the battle of Bull Run, Virginia, July 21st, 1861, a shell fracture of the cranium. He was admitted to a Confederate hospital at Culpeper, Virginia, on July 23d. Hernia cerebri ensued, and death occurred August 5th, 1861.

CASE.—Private *J. A. Nichols,* Co. B, 12th South Carolina Regiment, was admitted to Jackson Hospital, Richmond, Virginia, on August 18th, 1864, with a gunshot fracture of the cranium. Hernia cerebri complicated the case, which resulted fatally, August 24th, 1864.

CASE.—Lieutenant William A. O———, Co. B, 25th Connecticut Volunteers, aged 28 years, was wounded at Irish Bend, Louisiana, April 14th, 1863, by a conoidal ball, which entered the frontal bone beneath the supra-orbital arch, passed downward, and lodged in the antrum of Highmore. He was conveyed to New Orleans, and admitted into the University Hospital on the 17th, being at that time in a semi-comatose condition. He continued so for many days, at times answering questions very correctly, but manifesting symptoms of mental disturbance. The right eyelid was swollen to such an extent as to prevent any view of the eyeball. On the 22d, a fragment of bone, which had become entirely detached, was removed. When the tumefaction of the eyelid disappeared, it was found that the sight of the eye was uninjured. An abscess discharged its contents through an opening just beneath the supra-orbital arch. During the first two weeks of May the patient was very comfortable, but about the 15th of the month he began to decline. Hernia cerebri appeared through the opening in the frontal bone, but was readily reduced, and its recurrence prevented by a few turns of a roller. The original wound having quite firmly cicatrized, the hernia was afterward prevented from appearing externally. On the morning of the 20th the patient became suddenly worse; coma supervened, and death ensued on May 21st. At the autopsy, the meninges were found much inflamed, and a portion of the cerebral substance, about the size of the opening in the frontal bone, was completely disorganized to the depth of about three-fourths of an inch. No pus was discovered in the ventricles. The specimen is represented by the cut, and consists of a segment of the frontal bone and two fragments. The opening in the *os frontis* is nearly quadrilateral, measuring one inch from right to left, and one and one-fourth inches from above downward. A fissure of the external table extends to the temporal ridge. The specimen and history were contributed by Assistant Surgeon P. S. Connor, U. S. A.

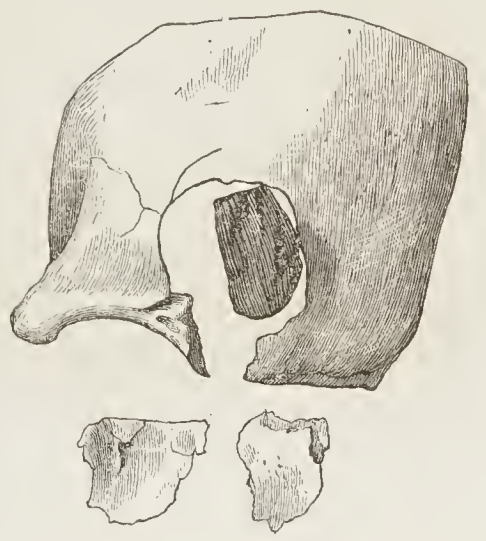

FIG. 151.—Segment of frontal bone fractured by a musket ball, which is shown *in situ*. *Spec.* 1297, Sect. I, A. M. M.

CASE.—Private *Philip P*———, Co. A, 1st Maryland Regiment, aged 29 years, was wounded at the battle of Gettysburg, Pennsylvania, July 1st, 1863, by a musket ball, which fractured both tables of the right parietal bone at its eminence. He was conveyed to Seminary Hospital, Gettysburg, and thence, on July 17th, transferred to the general hospital at Chester. The wound was in a healthy condition. On the 28th, several fragments of bone were removed, leaving an opening one-half by three-fourths of an inch, through which the pulsations of the brain could be distinctly seen. On August 8th, the wound began to slough. Hernia cerebri supervened and gradually increased to the size of an egg. All the symptoms of compression of the brain and paraplegia sinistra followed. The patient began to fail rapidly, and died on August 21st, 1863. The specimen is figured in the wood-cut, (FIG. 152,) and exhibits the aperture left after the removal of the depressed fragments of the right parietal bone. The edges of the opening are necrosed, and slight deposits of new ossific matter appear on the inner surface. The specimen and history were contributed by Acting Assistant Surgeon J. A. Draper.

FIG. 152.—Segment of skull, fractured by a musket ball. *Spec.* 2072, Sect. I, A. M. M.

Case.—Lieutenant John H. Porter, Bradford's Battalion, Tennessee Cavalry, aged 27 years, was wounded at Fort Pillow, Tennessee, April 12th, 1864, by a conoidal ball, which entered at the upper portion of the left side of the forehead, and in its passage chipped out a part of the frontal and left parietal bones, exposing the meningeal artery and the brain to the extent of an inch. He was conveyed by steamer to Mound City, Illinois, and admitted to the hospital at that place on April 14th. He was unable to speak, though quite rational, and would follow his friends at will with his eyes. In the progress of the case, periods of quiet and great restlessness alternated. On April 19th, the wound commenced to discharge, and on the 22d the patient could eat a little, but was still unable to speak; the bowels were costive. The discharge from the head increased, and on the 27th considerable brain matter protruded. For a day or two he seemed better, but on May 4th he became delirious, and remained in that condition until death supervened, June 21st, 1864.

Case.—Private James Ringwood, Co. A, 14th Connecticut Volunteers, was wounded at the battle of Cold Harbor, Virginia, June 7th, 1864, by a conoidal ball, which caused a compound comminuted fracture of right temporal and parietal bones. He was at once admitted to the hospital of the 1st division, Second Corps. His left side was paralyzed, and a portion of the brain protruded from the opening; the discharge of fæces was involuntary. Dr. A. Garcelon removed a portion of the bone. No further history can be obtained; but the man probably died in transit to a general hospital.

Case.—Private William Rogers, Co. G, 7th Ohio Volunteers, aged 23 years, was wounded at the battle of Port Republic, Virginia, June 9th, 1862, by a conoidal ball, which struck the *os frontis*, one inch above the edge of the right orbit, and about half an inch from the median line. He was rendered insensible for a few moments, but soon recovered sufficiently to walk from the field. He was admitted to Cliffburne Hospital, Washington, on the 15th. The wound was healthy in appearance, and discharged a thin, sero-purulent fluid; the pulsation of the brain was distinctly visible, and splinters and loose fragments of bone could be felt. Absolute quiet was enjoined, and light diet and simple dressing, with aperients, ordered. On the 17th he complained of increasing pains. Assistant Surgeon John S. Billings, U. S. A., enlarged the wound of entrance, and removed the fragments of bone with forceps. The ball could not be found, it having evidently entered the brain. The wound was left open, and lightly dressed with wet lint. The patient felt better the next day. The second day after operation, he complained of slight, persistent pain in the back of the head, which continued until the 20th, when a small fungus growth made its appearance in the wound. Suppuration, which had previously been profuse and healthy, was much diminished, and the pain increased. The fungus was readily detached with the handle of the scalpel, and its removal gave exit to an ounce of pus, which somewhat relieved the pain. Hernia cerebri again appeared on the 27th, and death took place on the evening of the 28th, 1862. The patient was never delirious, and could answer questions correctly up to an hour before his death. The autopsy revealed the ball, much fissured and twisted upon itself, lying in a sac of false membrane, about one inch beneath the dura mater. The whole anterior lobe was broken down, and of a pultaceous consistence, dark sanious pus filling the ventricular cavity. The adventitious tissue, which formed the bulk of the hernia and the cyst containing the ball, was soft, and under the microscope was seen to be composed of interlacing fibres, containing large cells in its meshes. The history of the case was contributed by Assistant Surgeon John S Billings, U. S. A.

Case.—Private James Seely, Co. D, 55th Ohio Volunteers, aged 21 years, was wounded near Atlanta, Georgia, July 20th, 1864, by a conoidal ball, which struck the right side of the frontal bone, one inch above the supra-orbital ridge, fracturing both tables. He was admitted into the field hospital at Chattanooga, Tennessee, on the 26th, and, on August 10th, transferred to Nashville, entering Hospital No. 1 the following day. A hernia cerebri protruded through the fracture. There was a slight discharge of pus from the wound. Patient suffered from pain in the head, irritability of stomach, and constipation of the bowels. His tongue was coated, pulse intermittent and pupils slightly dilated. On the 24th, he was placed under the influence of chloroform, and Acting Assistant Surgeon M. L. Herr removed several spiculæ of bone and excised the sharp edges, which were encroaching upon the brain, through a crucial incision two inches in extent. Spiculæ of bone were found forcibly driven between the inner table of the skull and the dura mater. Cold water dressings were applied to the wound, a compress placed over the hernia, and low diet prescribed. Death supervened on September 7th, 1864. At the *post-mortem* examination a large abscess in the brain was found, extending into the lateral ventricle, containing about five ounces of pus. The case is reported by Surgeon B. B. Breed, U. S. V.

Case.—Private George Taylor, Co. B, 157th Pennsylvania Volunteers, aged 18 years, was wounded at the battle of the Weldon Railroad, Virginia, August 20th, 1864, by a round musket ball, which entered the cranial cavity through the right lambdoid suture at a point about two inches from the median line. He was admitted to the hospital of the 4th division, Fifth Corps; thence, was sent to City Point, and, on August 28th, was admitted to the 3d division hospital at Alexandria, Virginia. Hernia cerebri protruded through the opening. The treatment consisted in the use of cold water applications to the head and counter irritation to the feet. The patient died, however, on August 29th, 1864. At the autopsy, seventeen hours after death, the perforation of the skull was found to be circular and larger at the inner than at the outer table; the dura mater was firmly adherent along the longitudinal fissure, especially on the right side; the arachnoid of the same side was thickened by numerous tufts of lymph, with but little effusion beneath it. The meninges at the base of the brain around the pons Varolii, over the fourth ventricle and about the crura cerebelli were, likewise, thickened and adherent to the brain. The brain itself was hardened and pale, except in the vicinity of the wound, where it was of a rich cream color and evidently degenerating into pus. On section the lateral ventricles were found filled with a fluid containing floating tufts of lymph, a thick deposit of which laid upon the choroid plexuses and walls of the ventricle. A round ball, half sliced open, and a disk of bone had lodged at a depth of one and a half inches in the right posterior occipital lobe, a little below the digital cavity, which had been involved in the inflammation. The case is reported by Surgeon E. Bentley, U. S. V.

Case.—Charles T———, Co. H, 63d New York Volunteers, aged 17 years, was admitted to Hospital No. 1, Frederick, Maryland, on September 28th, 1862, with a fracture of the skull. He was wounded at Antietam, September 17th, 1862, by a conoidal musket ball, which struck at the lower anterior angle of the right parietal, fractured both tables of the cranium, and

lodged under the scalp in the occipital region. The scalp was lacerated, and a dark pulsating mass protruded in the wound. The left side of the body was paralyzed. The patient's mental faculties were unimpaired. On September 29th, flaps of integument were reflected by a T-shaped incision. The ball and a number of fragments of bone were removed, some of the latter being imbedded in the brain substance. The inner table was found badly splintered, but the fracture of the external table was still more extensive. The protruding cerebral mass was shaved off. The rough edges of the fractured bone were smoothed by cutting forceps The following day the paralysis was more complete than before the operation. There was severe headache The pulse was slow and weak. On October 3d, the fungus was sprouting and sloughing. The left arm was powerless; the paralysis of the left leg was less complete. On October 4th, the hernia was again sliced off and gentle compression was applied. There was great irritability and restlessness. On October 21st, the patient had improved. His appetite was voracious. He was less irritable and the hemiplegia was much less complete. He was very sensitive to cold. The temperature of the left side was lower than that of the right. The fungus was of the size of a pigeon's egg. On November 17th, a dilatation of the left pupil was first noticed. Sensation in the left leg and partial control of the muscles had returned. Since the last report the tumor of the brain had continued to grow and slough away, so that it remained about the same size. On December 7th, the report states that little change had taken place, except a gradual amelioration of the hemiplegia, and improvement in regard to the fretfulness and irritability. On this day there was a severe chill. After this the patient never regained his accustomed readiness and clearness of mind. The discharge from the wound became watery, unhealthy, and more copious. There was an exacerbation of fever every afternoon. On December 17th, there was a severe convulsion which lasted half an hour, and was terminated by death. At the autopsy, an irregular portion of the right parietal, four inches in diameter, was found to be necrosed and detached. The dura mater was much thickened in the vicinity of the fracture, and was adherent to the margins of the healthy bone. Except in the immediate vicinity of the hernia, the brain matter appeared to be in a healthy state. Assistant Surgeon R. F. Weir, U. S. A., reported the case.

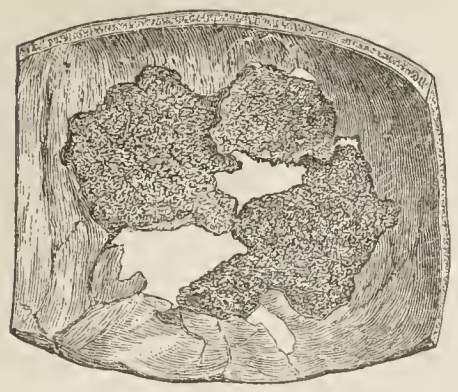

FIG. 153.—Gunshot fracture of the right parietal, followed by necrosis. Interior view. *Spec.* 3859, Sect. I, A. M. M.

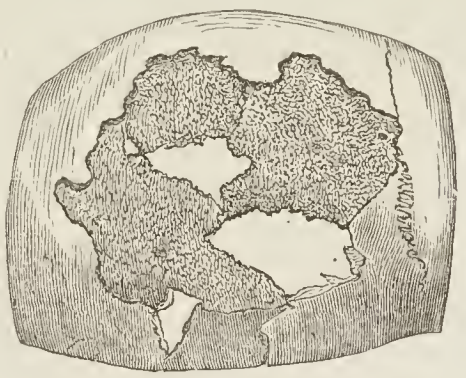

FIG. 154.—External view of gunshot fracture of right parietal, followed by necrosis.

CASE.—An unknown soldier, belonging to the 125th Ohio Volunteers, was brought to the field hospital at Chattanooga, Tennessee, on June 25th, 1864, with a gunshot fracture of the cranium, allowing a fungous mass of the brain substance to protrude. He was unconscious until the time of his death, which occurred on June 30th, 1864.

CASE.—An unknown Confederate soldier, belonging to the 61st North Carolina Regiment, was brought into the hospital at Fort Monroe, Virginia, October 4th, 1864, with a gunshot fracture of the cranium, received on September 29th, 1864. He was insensible, and brain substance protruded from the wound. Simple dressings were applied, but death resulted on October 5th, 1864.

CASE.—Private Edward V———, Co. D, 55th Ohio Volunteers, was wounded at the battle of Bull Run, Virginia, August 29th, 1862, by a conoidal ball, which struck half an inch above the right eyebrow, and the same distance from the median line of the *os frontis*, comminuting and carrying away both tables to the extent of one and one-fourth to two and one-fourth inches. He was wounded while in the act of discharging his gun, staggered considerably under the shock, but recovered immediately, so that he fired, loaded, and fired a second time before he fell. He lay on the field for six days, during which time a considerable amount of brain matter oozed from the wound. He was afterward conveyed to Washington, and admitted, on the 7th of September, into the Emory Hospital, where the wound was dressed for the first time. Half of the plates composing the frontal sinus were found turned in upon the brain, and about one-third of the ball was battered up against the fractured edge of the bone. When the missile and fragments of bone were removed a large quantity of fœtid pus and a teaspoonful of cerebral matter exuded. The most remarkable feature of the case was that there were no symptoms of injury to the brain, either in articulation, memory, sight, or animation. The wound was dressed with adhesive strips to keep the eyebrow from falling on the cheek. On the morning of the 8th, a hernia cerebri, an inch in diameter, made its appearance, pulsating with the heart's action The depressed walls of the frontal sinus were now removed by Assistant Surgeon J. D. Hall, 24th New York Volunteers, the operation being attended with slight hæmorrhage, a plentiful discharge of pus, and the escape of a teacupful of softened brain matter. On the 9th, the tongue was covered with a thick white fur; lips red, pulse nearly normal. No change occurred until the 19th, except that the wound became more painful, though it continued perfectly healthy. The hernia had gradually receded when, on the 20th, a colliquative diarrhœa set in, which, though arrested by astringents and opiates greatly reduced his strength; his mind, however, continued perfectly clear. Tonics, with nouishing diet, were administered, but he failed to rally, and died on the morning of the 25th. At the autopsy a large clot was found between the dura mater and the skull, at the coronal suture; and the meninges and brain exhibited a much greater degree of congestion and inflammation than any recent symptoms had indicated. The ventricles, on section, were found filled with serum and pus. The pathological specimen is No. 276, Sect. I, A. M. M. The cranium shows an extensive fracture of the right supra-orbital arch; a small fragment of the bone is attached. The entire arch is removed, leaving an opening into the cranium, two and one-half inches long and one and one-fourth wide, extending from the inner angle of the orbit to the anterior inferior angle of the right parietal. The orbital plate of the right superior maxilla is fractured and depressed and a fissure an inch long extends down the body of the bone. The specimen and history were contributed by Surgeon William Clendenin, U. S. V.

CASE.—First Lieutenant Nicholas Woolmar, Co. C, 26th Wisconsin Volunteers, aged 28 years, was wounded in an engagement at Atlanta, Georgia, July 20th, 1864, by a conoidal musket ball, which fractured the right parietal bone. He was admitted to the hospital of the 3d division, Twentieth Corps; on the 28th of the month, was transferred to the general hospital at Chattanooga, and three days later, was sent to the Officers' Hospital at Nashville. Paralysis supervened, and death resulted on August 21st, 1864. At the autopsy, a hernia cerebri was discovered protruding through the dura mater. Surgeon J. E. Herbst reported the case.

Of the fifty-one preceding cases, reported as examples of hernia cerebri, forty-four had a fatal result. Of the seven survivors, whose histories are first recorded, four recovered with the full integrity of their intellectual faculties, while three suffered so much from vertigo and headache as to be incapable of much mental exertion. Of the forty-four fatal cases, eight would appear to have been simply examples of primary protrusion of brain substance from extensive gunshot fractures, and thirty-six legitimate illustrations of the condition described by surgeons as fungus or hernia of the cerebrum. Four of the fifty-one patients were trephined, and in twenty-five cases fragments of bone were removed, the projectile also being extracted in four instances. The details of treatment will be discussed hereafter.

CONTRE-COUP.—I have admitted, on page 214, that the fissures of the sphenoid and frontal orbital plate of specimen 1318, figured by wood-cut 110, must be regarded as examples of fracture by contre-coup, unless they were accidentally produced after death. I regard the latter hypothesis as much the most probable. The case of Private L. B. Pollard, Co. G, 16th Maine, of which an abstract is given on page 178, is regarded by the pension examiner as an instance of fracture by contre-coup after gunshot injury of the skull. As the pensioner still survives, this diagnosis has, of course, not been verified. I am indebted to the examiner for the following letter, stating the grounds of his diagnosis:

AUGUSTA, MAINE, *November* 23*d*, 1870.

SIR: Perhaps this case, by a strict rendering, would not be classed as *contre-coup*, yet it was one where much of the damage was done by transmitted force. and therefore, in a general way, coming under that head. My record states the following: A ball nearly spent, as we may suppose, penetrated the skull in the middle of the forehead just at the edge of the hair, and there lodged without entering any farther. In addition to the local injury thus accomplished there was an extensive fracture of the right parietal bone. Although not directly opposite to the point where the force was applied, I believed it to have occurred under similar mechanical conditions, and thus classified it as I did. My record is not as full concerning details as would be the case in records of [compound?] fracture.

Very respectfully,

(Signed) JAMES B. BELL.

Dr. GEORGE A. OTIS, etc., etc.

All of the cases of alleged fracture by contre-coup after gunshot injury of the skull, in which I have been able to examine the evidence, are as unsatisfactory as those already referred to. Assistant Surgeon Woodhull, U. S. A. regards[1] the case recorded on page 213 (FIG. 109) as probably an instance of fracture by contre-coup; but I cannot share his opinion The preparation (No. 2871) plainly presents, I think, direct fractures only. There are three other specimens in the Army Medical Museum, which have been regarded as examples of fracture by contre-coup, from the impact of gunshot projectiles. These specimens are represented in Photographs 214, 215, and 216 of the Surgical Series,[2] and their imperfect histories are as follows:

"PHOTOGRAPH NO. 214. *Cranium Perforated by a Musket Ball.*—This cranium was presented to the Army Medical Museum by Surgeon Jerome B. Green, U. S. V., and is numbered 830 of the Surgical Section. A musket ball entered at the centre of the left branch of the coronal suture, and passed out at the posterior inferior angle of the right parietal bone, the

1 *Catalogue of the Surgical Section of the Army Medical Museum*, Washington, 1866, page 12.

2 *Photographs of Surgical Cases and Specimens.* Prepared by order of the Surgeon General by Brevet Lieutenant Colonel GEORGE A. OTIS, U. S. A., Curator of the Army Medical Museum, Washington, 1869. Vol. V, page 14.

opening of entrance being three-fourths of an inch, and that of exit one and one-fourth inches in diameter. There is a fracture of the right orbital plate of the frontal, of the squamous portion of the right temporal, and of the body of the right superior maxilla, ascribed to the effects of *contre-coup*. A fracture of the occipital bone extends from the opening of exit to the right jugular foramen. The frontal suture remains distinct, though the skull is that of a middle-aged man. The specimen is believed to have come from the Twelfth Army Corps hospital after the second battle of Bull Run." "PHOTOGRAPH No. 215. *Perforation of the Cranium by a Musket Ball.*—This cranium was picked up on the first Bull Run battle-field by Dr. F. Schaffhirt, and presented to the Army Medical Museum. It is No. 3251 of the Surgical Section. It displays a fracture caused by a musket ball, which, entering at the right fronto-parietal suture and temporal ridge, and fractured the frontal bone in a long fissure, which runs in front one inch above the orbits, and downward through the greater wing of sphenoid and squamous portion of the left temporal into the mastoid process. One fissure branches off above the left orbit and downward through the maxillary sinus. Another fissure passes posteriorly from the wound of entrance and upward through the right to the left parietal protuberance. Another fissure downward through the right auditory meatus has divided the petrous bone. Yet another fissure passes backward through the upper portion of right temporal into the occiput. The ball passed out at the upper part of occipital near the inter-parietal suture." "PHOTOGRAPH No. 216. *Gunshot Fracture of Skull.*—At a *post-mortem* examination of the body of an unknown soldier, at Lincoln Hospital, September 22d, 1864, it was ascertained that a conoidal musket ball had entered about one and one-half inches above the left ear, causing a compound comminuted fracture of the squamous portion of the temporal bone. The ball was found imbedded in the lower portion of the parotid gland. The vessels of the meninges of the brain were very much injected. The middle lobe of the left hemisphere was softened to the middle corner of the lateral ventricle, which contained a small quantity of fluid resembling blood. The specimen was contributed to the Army Medical Museum by Acting Assistant Surgeon H. M. Dean, and is No. 3254 of the Surgical Section. It is a section of the cranium, showing penetration and fracture of the left temporal bone just above the meatus auditorius externus, which is entered by the fissure, together with a connected fracture of the occipital, which has been regarded as an indirect fracture by *contre-coup*, caused by a conoidal ball, which is attached to the aperture of entrance. The opening is just above the root of the zygoma and is three-fourths of an inch in diameter. The condyle of the lower jaw and the posterior half of the glenoid fossa are carried away, together with the extremity of the petrous portion of the temporal bone, the line of fracture passing through the internal meatus auditorious. From the left jugular foramen two lines of fracture pass to the foramen magnum, one in front of and the other behind the condyle. On the right side the occipital bone is traversed by a fracture which runs from the foramen magnum to the posterior angle of the right parietal."

Another case of alleged fracture by contre-coup of both orbital plates of the frontal by the transmitted shock from the perforation of the occipital by a pistol ball, has been much commented on:

CASE.—A. L———, aged 56 years, was shot in the head, at Washington, on the evening of April 14th, 1865, by a large round ball, from a Derringer pistol, in the hands of an assassin. Dr. Charles A. Leale being close at hand, went instantly to the wounded man, whom he found "in a profoundly comatose condition." * * the breathing "exceedingly stertorous." (These and other quotations in the first part of this abstract, are taken from a report compiled by Dr. Leale, from notes made at the time.) No pulsation was perceptible at the right wrist. When the head was examined, "I passed my fingers over a large firm clot of blood, situated about one inch below the superior curved line of the occipital bone and an inch and a half to the left of the median line of the same bone. The coagulum, I easily removed, and passed the little finger of my left hand through the perfectly smooth opening made by the ball, and found that it had entered the encephalon. As soon as I removed my finger, a slight oozing of blood followed, and his breathing became more regular and less stertorous." After the administration of a small quantity of brandy and water, of which a mouthful appeared to have passed into the stomach, the patient was removed to a neighboring house, with the assistance of Acting Assistant Surgeons C. S. Taft and A. F. A. King, and others. His clothing was removed, and he was placed in bed. His extremities were cold. He was covered with warmed blankets, and bottles of hot water were applied to the lower extremities. It was now about eleven o'clock at night, the wound having been inflicted about half past ten. His family physician, Dr. Robert H. Stone, and Surgeon General Barnes, and Assistant Surgeon General Crane, arrived presently, and assuming charge of the case, proceeded to examine the patient and the wound. The pulse was very feeble and vacillating, from 40 to 48; the respiration was oppressed and labored; the surface was cold Over the left eye-lid there was slight ecchymosis. "The pupil of that eye was slightly dilated, the left pupil was contracted;" both were irresponsive to light. Sinapisms were applied to the surface. A few drops of brandy and water placed into the fauces was not swallowed, and the attempt to administer internal stimulants was not insisted on. It was observed that when blood and cerebral matter oozed unimpededly from the wound the condition of the pulse and respiration improved. The Surgeon General accordingly kept the external wound open by means of a silver probe, until, a Nélaton's probe being brought, he made an exploration of the course of the ball. A splinter obstructed the track at the depth of about two and a half inches. An inch and a half further on the bulb came in contact with a foreign body, which proved to be the disk from the occipital forced out by the ball; passing beyond this the ball was detected, at a distance of over six inches from the entrance wound. Drs Stone and Crane having also distinctly felt the ball at this depth in contact with the bulb of the probe, it was decided that no attempt should be made to remove it or the foreign bodies, further than "to keep the opening free from coagula, which, when allowed to form and remain for a very short time, would produce signs of increased compression, the breathing becoming profoundly stertorous and intermittent, and the pulse more feeble and irregular." Notwithstanding the free oozing from the external orifice, there was evidently much internal bleeding going on, as was indicated by the excessive extravasation into the orbits, accompanied by great ecchymosis of the eyelids. The protracted death-struggle ceased at twenty minutes past seven o'clock on the morning of April 15th, 1865. At noon, an autopsy was made in the presence of the Surgeon General and others, by Assistant Surgeon J. J. Woodward, U. S. A., aided by Assistant Surgeon Edward Curtis, U. S. A. The following is an extract from the official report to the

Surgeon General by Dr. Woodward, compiled the same day from notes taken at the time of the *post-mortem* examination: "The eyelids and surrounding parts of the face were greatly ecchymosed and the eyes somewhat protuberant from effusion of blood into the orbits. There was a gunshot wound of the head, around which the scalp was greatly thickened by hæmorrhage into its tissues. The ball entered through the occipital bone about an inch to the left of the median line and just above the left lateral sinus, which it opened It then penetrated the dura mater, passed through the left posterior lobe of the cerebrum, entered the left lateral ventricle, and lodged in the white matter of the cerebrum just above the anterior portion of the left *corpus striatum*, where it was found. The wound in the occipital bone was quite smooth, circular in shape, with beveled edges, the opening through the internal table being larger than that through the external table. The track of the ball was full of clotted blood and contained several little fragments of bone, with a small piece of the ball near its external orifice. The brain around the track was pultaceous and livid from capillary hæmorrhage into its substance. The ventricles of the brain were full of clotted blood. A thick clot beneath the dura mater coated the right cerebral lobe. There was a smaller clot under the dura mater of the left side. But little blood was found at the base of the brain. Both the orbital plates of the frontal bone were fractured, and the fragments pushed up toward the brain. The dura mater over these fractures was uninjured. The orbits gorged with blood." * * * Basing his remarks on an account of this case and of the *post-mortem* examination published by Acting Assistant Surgeon C. S. Taft,* Professor T. Longmore, of Netley, observes: The autopsy showed that the projectile had penetrated the occipital bone one inch to the left of the longitudinal sinus; had driven before it, for about three inches, the piece of bone which it had punched out, as it were; and that, leaving this fragment behind, it had itself then passed on obliquely across, from left to right, through the brain substance to the anterior lobe of the right hemisphere, in which it lodged, immediately over the right orbit. The ball did not strike the anterior part of the cranium, its force having been expended before reaching so far; yet, at the autopsy, according to the report of the *post-mortem* appearances furnished by Assistant Surgeon C. S. Taft, U. S. A., to the *Philadelphia Medical Reporter*, "the orbitar plates of *both* orbits were found to be the seats of comminuted fracture, the fragments being forced inward, and the dura-mater covering them remaining uninjured. This double fracture was decided to have been caused by contre-coup. If the term 'contre-coup' be limited to its precise signification of 'counter-stroke'—*i. e.*, the impression made by the stroke on the part of the cranium opposite to that directly struck by the ball—will the force of contre-coup explain the fractures in this instance? It seems very difficult to conceive that the orbitar plates could be fractured by such a counter-stroke, while the portion of the cranial arch opposite to that which received the primary blow, including the expanse of the frontal bone and the several processes within which the orbitar plates are held, and by which they are so strongly protected in all directions laterally remained entire and unchanged. I am inclined rather to attribute the lesions mentioned to a transmitted undulatory stroke or sudden impulse of the brain-substance itself, against the thin bony layers constituting the orbitar plates. I am in possession of the notes of a case in which a similar fracture took place in one orbitar plate, from a ball passing along, only grooving, the upper surface of the hemisphere lying over the plate broken. In this instance there was no reason to doubt that the impulse communicated to the brain substance by the passage of the projectile had been continued on with sufficient force to the orbitar plate to effect its fracture."†

The explanation offered by Dr. Longmore of the cause of fracture of the orbital plates, in this remarkable case is, in the writer's opinion, more satisfactory than the hypothesis that the fractures were produced by contre-coup. The unusually thin orbital plates on either side were exposed to the impulse of the cerebral pulp. Even if they were not fully protected from the vibrations in the vault of the cranium, by the dense supra-orbital ridges, it might be inferred that the force would be transmitted mainly to the right orbital region, or that opposite the entrance perforation. Whereas *both* orbital plates were fractured. That the fragments inclined upward toward the brain rather than downward and forward, was probably due to the pressure of the blood extravasated within the orbits. It may be safely asserted that, abstracting the fractures of the inner without injury to the outer table, no incontestable instance has been produced of counter-stroke fracture of the skull from gunshot, a negative result which the laws governing the transmission of forces would lead us to anticipate.

SUMMARY.—Excluding those immediately fatal on the field, the cases of gunshot injuries of the cranium which were reported during the War, numbered forty-three hundred and fifty. The results are set forth in the table to be found on the next page (TABLE VI), which is a statistical statement of the different divisions of gunshot injuries treated of from page 95 to this point.

* *The Medical and Surgical Reporter*, Philadelphia, Vol. XII, p. 453. Among many other inaccuracies, the reporter describes the ball as passing into the right hemisphere. But this error does not affect the argument of Professor Longmore.—COMPILER.

† *The Lancet*, London, 1865, Vol. 1, p. 649. Professor Longmore adds a report of a most interesting autopsy made by Deputy Inspector-General R. Lawson, in a analogous case, in which the left orbital plate was fractured after a fracture of the left parietal by a musket-shot. This is the only other instance I know of in which the occurrence of this rare injury is referred to by writers on gunshot injuries of the head, and is well worth the reader's attention.—COMPILER.

TABLE VI.

Results of Four Thousand Three Hundred and Fifty Gunshot Injuries of the Cranium reported during the War of the Rebellion.

INJURIES.	Cases.	Recovered.	Died.	Undetermined.	Ratio of mortality.	REMARKS.	Page.
Contusions of the skull	328	273	55	.....	16.8	260 Union, 68 Confederate	95
Fractures of outer table alone (?)	138	128*	10	.....	8.7	111 Union, 27 Confederate	128
Fractures of inner table alone	20	1	19	.....	95.	18 Union, 2 Confederate	141
Linear fissure of both tables	19	12	7	.....	36.8	4 examples given	159
Fracture of both tables without known depression	2,911	1,001	1,826	84	64.6	40 histories selected	161
Depressed fractures	364	231	129	4	35.8	164 histories selected	167
Penetrating fractures	486	68	402	16	85.5	Abstracts of 93 given	190
Perforating fractures	73	14	56	3	80.	Abstracts of 26 given	206
Ecrasement or crash or smash	9	.....	9	.....	100.	Abstracts of all given; 6 U., 3 C.	212
Contre-coup (?)	2	1	1	.....	50.	1 Union, 1 Confederate	304
Aggregates	4,350	1,729	2,514	107		*Two of these died from intercurrent diseases.	

The results of contusions have been fully considered on page 126, fractures of the outer table on page 140, of the inner table on page 150.

The large ratio of mortality of the "*fractures of both tables without known depression*," in comparison with the fatality of the cases, in which depressed fracture was unquestioned, must attract attention. The explanation of this apparent anomaly is that many speedily fatal cases, in which no accurate diagnoses were rendered, were included with the deaths without *known* depression.

Of cases reported as "*gunshot contusions of the skull*," and of the so-called "*fractures of the outer table alone*," and of linear fissure of both tables, there must have been many in which symptoms were obscure and diagnosis difficult and fallible. The fractures confined to the inner table could only be observed after death, except in such extraordinary cases as that recorded on page 149, where a segment of bone exfoliated and revealed the fracture of the inner table. Doubtless among the cases enumerated as contusions there were those in which the inner table may have been fractured.

It will be observed that the mortality was slightly less, when the missile passed completely through the cranial cavity, making an aperture of exit, than when it penetrated and lodged.

Abstracting the one hundred and seven cases in which the results could not be ascertained, there remain four thousand two hundred and forty-three cases, with a general mortality of 59.2 per cent.*

* In the Surgical report in Circular No. 6, S. G. O., 1865, p. 9, I have referred to seven hundred and four cases of gunshot fractures and injuries of the cranial bones, the results of which were then determined. Among these there were five hundred and five deaths, or a mortality of 71.7 per cent. In the report of the surgery of the British Army in the Crimea, already cited, Staff Surgeon T. P. MATTHEW enumerates (*op. cit.*, Vol. II, p. 286) eight hundred and ninety-eight gunshot wounds of the head, of which two hundred and thirty are classified as contusion or fracture or penetration or perforation of bones of the cranium. Of these, one hundred and seventy were mortal, or 73.9 per cent. M. CHENU, in his Crimean report (*op. cit.*, p. 134), classifies two thousand seven hundred and seventy-four wounds of the head under the four divisions of: fractures, undetermined wounds, simple wounds,

Recapitulation and General Observations.—Leaving, for the moment, the gunshot injuries of the cranium, we may now sum up the injuries of the head from all causes, in order to engage in those general observations that apply to them in common, and such special remarks as have been deferred.

The whole number of cases of injuries of the head from all causes, reported to this Office during the war, by name, was twelve thousand nine hundred and eighty, which were classified in Table VII.

Table VII.

Nature and Results of Twelve Thousand Nine Hundred and Eighty Injuries of the Head from all Causes as reported during the War.

Injuries.	Cases.	Deaths.	Discharges.	Duty.	Result Unknown.
Incised Wounds of the Scalp	282	6	68	208	.....
Incised Fractures of the Cranium	49	13	12	24	.....
Incised Wounds of Scalp	28	1	10	17	.....
Punctured Wounds of the Scalp	18	2	4	12	.....
Punctured Fractures of the Cranium	6	5	1	.....	.....
Contusions and Lacerations of the Scalp	331	.....	21	309	1
Concussions from blows, falls, railway accidents, etc.	72	14	43	13	2
Fractures of Skull from similar causes	105	57	28	17	3
Gunshot Wounds of the Scalp	7,739	162	1,176	3,689	2,712
Gunshot Contusions of the Bones of the Skull	328	55	173	100	.....
Gunshot Fractures of the Outer Table (?)	138	10	66	62	.....
Gunshot Fractures of the Inner Table	20	19	1	.....	.....
Linear Fissures caused by Gunshot	19	7	12	.....	.....
Gunshot Fractures without known Depression	2,911	1,826	651	309	125
Depressed Gunshot Fractures of the Skull	364	129	190	42	3
Penetrating Gunshot Fractures	486	402	65	19	.....
Perforating Gunshot Fractures	73	56	17	.....	.....
Smash	9	9	.....	.....	.....
Contre-coup(?)	2	1	1	.....	.....
Aggregates	12,980	2,774	2,539	4,821	2,846

From these twelve or thirteen thousand cases, some particulars have been given in the foregoing pages of the histories of twenty-five hundred and thirty-two patients. Analyses of the abstracts of the three hundred and eighty-three cases in the first five subdivisions have been given on pages 15, 23, 31, and 34. The results of five hundred and eight injuries from miscellaneous causes, recorded in the next three classes of Table VII, are summed up on pages 61 and 69.

and contusions, with a fatality of seven hundred and sixty-four, or 27.5. Of gunshot fractures of the cranium, M. Chenu gives seven hundred and thirty-one cases, with five hundred and forty-one deaths, or a mortality of 74 per cent. In the Austro-Franco-Italian war of 1859, M. Chenu (*op. cit.*, T. II, p. 424) tabulates seven hundred and seventy-nine wounds of the head from all causes, with four hundred and fifty-six deaths, a mortality of 58.53. These are classified as contused, complicated, and undetermined wounds, contusions and unspecified (sans indications) injuries. There were two hundred and thirty-three contused wounds by musket balls, with two deaths, and twelve from shell fragments, with three deaths. There were fifty-two contusions from musket balls, with three deaths, and eleven from cannon balls or shell fragments, all of which were fatal. There were forty-three undetermined wounds from small projectiles, and ten from large missiles, with four deaths. There were two hundred and twelve complicated wounds from musket balls and twenty-two from cannon balls or shell fragments, with a mortality of one hundred and eleven, or altogether five hundred and ninety-five cases of gunshot injuries of the head, with one hundred and thirty-four deaths, or 22.5 per cent. Of the total number of gunshot injuries, it would appear that two hundred and thirty-seven were attended by fractures or grave injuries of the skull, with a mortality of one hundred and fourteen cases, or 48 per cent. Inspector General Mouat reports, from the New Zealand War, thirty-six gunshot wounds of the head among the officers and men of the British Army. Of twenty patients with scalp wounds, all recovered and were discharged to duty; five cases of injury of the cranial bones, with two recoveries and three discharges for disability, and eleven fatal fractures of the cranium, with wounds of the brain.

In the earlier part of the chapter, commencing on page 95, with Abstract 1095, and ending with Abstract 1422, on page 126, memoranda of three hundred and twenty-eight gunshot contusions of the bones of the skull are noted, the results being analyzed on that and the two succeeding pages, to which the reader must be referred for the conclusions that have been derived from a study of the individual cases. On page 140 is a summary of the one hundred and thirty-eight cases of alleged gunshot fracture of the outer table alone. From page 150 to page 159, the gunshot fractures of the inner table alone are discussed. Then follow a large number of cases of gunshot fractures of the cranium, without known depression, and of depressed or penetrating or perforating fractures; of these, only selected abstracts are printed, the summaries of the subdivisions being brief, as this, the most important part of the subject, is yet to be considered in the closing observations. The cases in which operations were performed are included in the aggregates of TABLE VII. It will be best, therefore, to give a separate table of operations, and then to sum up the the remaining cases of gunshot fracture before proceeding to a more general discussion of the head injuries referred to in the foregoing observations.

TABLE VIII.

Results of Nine Hundred Cases of Injuries of the Skull in which Operations were performed.

OPERATIONS.	Cases.	Recoveries.	Deaths.	Undetermined.	Ratio of mortality.	REMARKS.
Extraction of missiles	175	89	83	3	48.3	The missiles extracted from beneath the sealp or soft parts are not reckoned in this table.
Ligations	33	21	12	.....	36.3	
Removal of bone splinters or elevation of depressed bone.	454	275	176	3	39.0	
Formal trepanning	220	95	124	1	56.6	
Operations for hernia cerebri	29	7	22	.....	75.8	

Abstracting from the twenty-nine hundred and eleven cases of fracture without known depression the eighteen hundred and twenty-six fatal cases, there remains one thousand and eighty-five cases, of which two hundred and sixty-two were subjected to some form of operative interference, and eight hundred and twenty-three were treated without a resort to such measures. Of these eight hundred and twenty-three cases, two hundred and sixty-nine were returned to duty, fifty-seven went to modified duty in the Veteran Reserve Corps, two hundred and seven were discharged, one hundred and thirty-five either exchanged, paroled, retired, furloughed, or released, thirty deserted, and in one hundred and twenty-five instances the ultimate result could not be ascertained. Of the two hundred and sixty-nine cases of patients returned to duty, the names of two hundred and thirty-four do not appear on the pension rolls; their histories present few particulars of interest; but in thirty-five cases of pensioners are some among which a few of the reports of the Pension Examiners are of interest:

NITSCHKE, A., Sergeant, Co. A, 26th Wisconsin Volunteers, aged 23 years. Resaca, Georgia, May 15th, 1864. Treated at Bridgeport and Milwaukee. Duty, March 15th, 1865; discharged June 24th, 1865. Examiner James Diefendorf, M. D., reports, July 6th, 1865, his disability at three-fourths and probably permanent, and that the ball split on the frontal bone, separated in three parts, and destroyed a square inch of cranial parietes.

RYAN, P., Private, Co. F, 27th Indiana Volunteers. Gettysburg, July 3d, 1863. Fracture of left parietal by fragment of shell. Treated at Camp Letterman, McDougall, and De Camp Hospitals. Duty, February 20th, 1864; discharged October 10th, 1864. Examiner J. T. Dodd reports, January 10th, 1865, that there is a sulcus, showing a loss of osseous tissue one inch and a half long and three-fourths of an inch wide, and that the applicant stated that he suffered from vertigo and pain on stooping.

BROWN, NATHANIEL, Private, Co. D, 154th New York Volunteers, aged 29 years. Chancellorsville, May 3d, 1863. Treated at hospital of Eleventh Corps, Carver, and De Camp. Duty, May 11th, 1864; discharged June 11th, 1865. Examiner Thomas J. King, M. D., reports portion of frontal, about one inch in diameter, carried away; fistulous opening remains; several pieces of bone exfoliated; discharge still continues from opening; the pensioner suffers from vertigo.

SAWYER, J. H., Private, Co. K, 11th New York Battery. Gettysburg, July 3d, 1863. Treated at Seminary, McDougal, and DeCamp Hospitals. Duty, February 11th, 1864; discharged December 6th, 1864. Examiner Samuel C. Wait, M. D., reports that the bullet struck the middle of the left frontal bone; necrosis and discharge of pieces of bone; paralysis of left side for four weeks, and headache; cannot bear heat of sun nor warming influence of exercise or labor without severe headache, dizziness, and confusion of thought; was of opinion that the bullet was still in the head.

HARRIS, GEORGE, Private, Co. D, 35th Indiana Volunteers, aged 20 years. Kenesaw Mountain, June 18th, 1864. Fracture of left parietal by conoidal musket ball. Treated in Corps, Nashville, Louisville, and Evansville Hospitals. Duty, November 16th, 1864; discharged September 30th, 1865. Examiner E. R. Hawn, M. D., reports, April 27th, 1869, mental faculties greatly impaired; is almost an idiot.

THOMPSON, HELIM, Corporal, Co. E, 44th New York Volunteers, aged 24 years. Gettysburg, July 2d, 1863. Fracture of nasal and temporal bones, and wounds of right shoulder and leg. Treated at regimental hospital and at York, Pennsylvania, and returned to duty, April 4th, 1865; discharged June 3d, 1865. Examiner George W. Cook, M. D., reports, March 27th, 1868, deafness in right ear, inability to close right eye, closure of nasal duct and paralysis of right cheek.

SILLOWAY, BENJAMIN W., Private, Co. B, 7th New Hampshire Volunteers, aged 39 years. Chapin's Farm, October 7th, 1864. Fracture of frontal by conoidal ball. Treated at Tenth Corps hospital and Fort Monroe. Duty January 8th, 1865; discharged July 20th, 1865. Examiner William G. Perry, M. D., reports, January 12th, 1867, that about a square inch of the bone was gone; that he cannot stoop without becoming dizzy; had headache most of the time.

The remaining twenty-eight pensioners are reported as suffering from vertigo, headache, and other causes, disabling them from mental or physical exertion.

Of the fifty-seven sent to the Veteran Reserve Corps, from the group of eight hundred and twenty-three cases, six were subsequently pensioned.

ESSELSTINE, L. W., Sergeant, Co. L, 1st New York Cavalry, aged 26 years. New Market, Virginia, May 15th, 1864. Fracture of left mastoid process by musket ball. Treated at Frederick, Baltimore, and Elmira. Transferred to Veteran Reserve Corps, January 3d, 1865; discharged July 24th, 1865. Examiner J. K. Stanchfield, M. D., states, April 23d, 1868, that he is deprived of the sense of hearing and the power to close the eye, and that the facial muscles of the left side of the face are paralyzed.

The five other pensioners of this class suffer from cephalalgia, loss of memory, partial paraplegia, and vertigo. The histories of the fifty-one patients who were not pensioned present few particulars of interest.*

Of the series of two hundred and seven patients of this group discharged for disability, thirty were pensioned. A few abstracts are selected:

KRUGER, B., Private, Co. A, 8th New York Volunteers. Bull Run. August 29th, 1862. Fracture of zygomatic process of left temporal. Treated at Fairfax Seminary, Washington, and Philadelphia. Discharged December 18th, 1862. Examiner Charles Phelps, M. D., reports that the sense of hearing of left ear is entirely destroyed, and that there is constant and profuse otorrhœa.

KAHLER, LEWIS, Private, Co. I, 13th New Jersey Volunteers, aged 44 years. Chancellorsville, May 3d, 1863. Fracture of occipital bone by conoidal ball, which lodged beneath the mastoid process in sterno-mastoid muscles. Treated at Washington and discharged November 7th, 1863. Examiner T. B. Smith, M. D., November 9th, 1863, reports that the missile has not been removed and that it is the cause of constant irritation and stiffness of neck. Examiner Philip Leidy, M. D., March 6th, 1867, states that there is vertigo, dimness of vision, and pain in head, and that the power of locomotion is somewhat interfered with.

WAINWRIGHT, JAMES A., Private, Co. I, 15th New Jersey Volunteers, aged 34 years. Cedar Creek, October 19th, 1864. Fracture of frontal bone by conoidal ball. Treated in field, at Baltimore, and Philadelphia. Discharged June 16th, 1865. Examiner Alfred Edeline, M. D., reports that there is dimness of vision and discharge of offensive matter from nostrils. The pensioner claims that the missile has not been extracted. The second finger of right hand has been amputated for gunshot wound, leaving the other fingers contracted.

* One of these invalided men had suffered from erysipelas of the scalp; another had survived a copious hæmorrhage from the temporal artery, on the thirteenth day after the injury, necessitating the ligation of the vessel; and three had endured protracted convalescence because of necrosis of the skull with frequent exfoliations.

CURTISS, ROBERT G., Private, Co. D, 34th Massachusetts Volunteers, aged 18 years. New Market, May 15th, 1864. Fracture of frontal bone by conoidal musket ball. Treated at Cumberland and Worcester. Discharged June 2d, 1865. There is loss of bony structure and his disability is rated three-fourths and permanent.

COUNTERMINE, CHARLES F., Private, Co. C, 140th New York Volunteers, aged 20 years. Five Forks, April 1st, 1865. Fracture of the left parietal bone by conoidal ball. Treated in field and at Washington, and discharged July 31st, 1865. Examiner M. D. Benedict, July 31st, 1865, reported that the inner table was depressed, and that the pensioner suffered from partial paralysis.

DUNNING, EUGENE H., Private, Co. I, 140th New York Volunteers, aged 21 years. Wilderness, May 5th, 1864. Treated in field, Washington, and Baltimore, and discharged July 9th, 1865. Examiner B. L. Horey, M. D , July 13th, 1869, reports that he believes that the inner table is depressed, and that the pensioner suffers from vertigo and defective vision.

HILL, GILLIAM, Private, Co. G, 31st Illinois Volunteers, aged 26 years. Kenesaw Mountain, Georgia, June 27th, 1864. Fracture of frontal bone, and injury of right eye by conoidal musket ball. Treated in field, New Albany, and Quincy, and discharged May 11th, 1865. Examiner John W. Mitchell, April 25th, 1866, reports that there is a cavity in the skull corresponding to the size of the bullet, and that exertion causes headache, vertigo, and dimnesss of vision.

ICKERMAN, FREDERICK, Private, Co. I, 34th Illinois. Jonesboro', September 1st, 1864. Fracture of parietal by musket ball. Treated in field, Chattanooga, and Nashville, and discharged July 12th, 1865. Examiner D. Trask Etter, M. D., January 14th, 1869, reports that the membrane of the drum of the left ear is destroyed.

LUCE, ALBERT, Private, Co, B, 17th United States Infantry, Gettysburg, July 2d, 1863. Fracture of the cranium. Examiner Edward F. Upham, June 6th, 1866, reports that the jaws cannot be separated, and that there is evidenee of chronic sottening of the optic nerves.

The remaining twenty-one pensioners suffered in some instances from exfoliation and in most from cerebral irritability. Of the one hundred and seventy-seven soldiers who were not pensioned, about one-third were discharged because of the expiration of their term of service and the rest for such physical disabilities as vertigo, headache, mental imbecility, epilepsy, deafness, or defective vision. The reports of these cases record no unusual or peculiar symptoms or circumstances.

The reports of forty-nine instances of recovery after gunshot fracture of the cranium without known depression,—cases of Confederate prisoners treated in Union hospitals and transferred to the Provost Marshal General for exchange,—afford little material for comment. Nearly all of the patients were very young men.* The duration of treatment in hospitals averaged about two and a half or three months. One of the cases was complicated by a perforating wound of the thorax; another by several flesh wounds, and a third by variola. The confinement of these prisoners secured for them the advantages of absolute rest, and, usually, of restricted diet. As far as can be gleaned from the reports, the general treatment in the majority of cases appears to have been expectant or mildly antiphlogistic. The local measures were the shaving of the scalp in the vicinity of the wound and the application of cold-water dressings, except in one instance, of an inflamed scalp wound, which was advantageously poulticed.

The cases of ten Confederate prisoners reported as "paroled," and of five whose surgical histories are terminated by the entry "released," were of the same general character of those of the series just adverted to, and call for no remark, except that in one instance (Private W. N. Denmark, 9th Georgia Regiment, aged 18 years) nearly resembling that of Bemis (page 162, *ante*) in the extent of the wall of the cranium destroyed, there was no cerebral disturbance from first to last.

In the Confederate Surgical records, histories are found of seventy-one cases of recovery from gunshot fractures of the cranium without known depression. Fifty-seven of the patients were furloughed, nine were retired, and five were sent to modified duty.

* The oldest was Private W. Randall, Co. K, 19th South Carolina Regiment, aged 38 years, wounded at Snake Creek Gap, October 15th, 1864. The next in age was Lieutenant J. N. Moore, 48th Virginia Infantry, wounded July 9th, 1864, at Monocacy, aged 30 years. The rest were from 20 to 25 years of age.

With few exceptions all of these patients suffered from very grave disabilities. Six of them were utterly disabled by complete hemiplegia, and others labored under partial paralyses. Two of them were blind, one was totally deaf, and one was affected by asphasia. Others had epilepsy. The gravity of the disabilities under which these officers and men were released from duty indicates the stringency of the examinations for discharge from service in the Confederate armies.* The series of thirty cases of deserters from hospitals comprises none of any especial interest. In one instance, deafness had resulted from the injury; but this is the solitary example of any complication of note.

Of the undetermined cases from the Union army, a number probably proved fatal in transit to hospital; others, perhaps slightly wounded, most likely went home; the Confederate cases cannot be traced further, because the records of the southern hospitals are only fragmentary.

The group of three hundred and sixty-four cases, included in TABLES VI and VII, as *depressed gunshot fractures*, comprizes all those examples of depression that are not included among fractures of the inner table, linear fissures, penetrating and perforating fractures, and cases of smash or of alleged fracture by counter-stroke. Doubtless this group should receive large additions from that of fractures without known depression. In these divisions there are slight discrepancies in the figures representing the final disposition made of cases, discrepancies arising from the fact that the tables were computed at different dates, and that cases entered as undetermined in one appear accounted for in the other. The successive transfers of patients from hospitals near the seat of operations to those more remote made it often difficult, as has already been remarked, to ascertain the ultimate results, except in cases of death, which were separately entered on alphabetical registers, so that the aggregates of mortality may be relied upon as nearly accurate.

Some remarks have been already offered on pages 193 and 196 regarding the group of four hundred and eighty-six *penetrating gunshot fractures*, and abstracts of ninety-three cases are there given, while many others are cited under the headings *removal of fragments*, page 215, and *trephining*, page 261.

The *perforating gunshot fractures* and the examples of *smash* and of alleged *contre-coup* are subdivided and commented upon on pages 206, 211, 212, and 304.

"*Nullum capitis vulnus contemnendum*" was the warning of Hippocrates. "*Nam veluti magna et gravia capitis vulnera non sequitur mors, sic et levia sæpenumero mortis causæ sint*" amplified Galen. "*No injury of the head is too slight to be despised, or too grave to be despaired of,*" paraphrased Liston, a text fully exemplified in the preceding pages.

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*For example, Surgeons F. N. Patterson, E. M. Waters, and J. B. Thomas, P. A. C. S., constituting the retiring medical examining board, at Richmond, in 1865, have under consideration the case of Private *James F. Blackwell*, Co. E, 15th Virginia regiment, whom Captain Gover certifies to have been severely wounded in both thighs, at the battle of Sharpsburg, September 17th, 1862. This man was enlisted June 19th, 1861, to serve twelve months. His application and Captain Gover's certificate are approved by Major C. H. Clarke, commanding regiment, Brigadier-General M. D. Corse, Major-General G. E. Picket, and Lieutenant-General J. Longstreet, and the Board finds: That the patient is "permanently disabled from any service in consequence of gunshot wound of the superior and posterior portion of the right thigh; ball passing behind the femur, and, coming out, reëntered on the inner side of middle of left thigh, severing femoral artery, and fracturing femur, and finally making its exit two inches above the superior border of the patella. Left limb is considerably atrophied. He is therefore retired." This paper is approved by Assistant Adjutant General W. H. Taylor, by order of General R. E. Lee; but the Board is respectfully reminded of Par. VII, G. O. 71, A. and I. G. O., 1864, and instructed that "if unfit for duty in the field, but capable of performing duty in some department of the service, the Board will specify for what position he is best qualified, and, if he has heretofore been detailed upon any light duty, the Board will state how and when employed, and if his services are still desirable in such position. The medical examining board near Petersburg, consisting of Surgeons H. H. Hubbard, G. W. Langdon, L. P. Warren, B. F. Ward, and C. B. McGuire, P. A. C. S., had before them in March, 1865, among others, Private *James Aycock*, of Captain D. T. Hardin's company (C), of the 15th North Carolina regiment, whose application being according to rule, and endorsed by the company, regimental, brigade, division, and corps commanders, is favorably considered on the ground that "a gunshot wound of the left parietal bone, fracturing it, and succeeded by paralysis of the right arm, received at South Anna bridge, July 4th, 1863, while in the service of the Confederate States and the line of duty" disabled him "from all duty." This finding is approved by Assistant Adjutant General Venable, by order of General Lee; but the Board is reminded by an endorsement similar to that already quoted of the desirableness of assigning the applicant to "any light duty" in preference to retirement.

The complications that may be present in injuries of the head are hæmorrhage, concussion, compression, cerebral irritation, foreign bodies, extravasations, meningitis, encephalitis, and purulent infection. I need not speak of *concussion*;[1] its signs are well known, and no light has been thrown on its obscure pathology by the observations here collected. External and intra-cranial hæmorrhages have been considered on pages 16, 80, 101, 255, and 289, and abstracts of fifty-three cases of extravasation of blood within the skull have been printed. All but three of these cases were fatal. In ten, trephining, and in nine, removal of fragments, were practiced, with success in only three instances. Hence it may be concluded that in intra-cranial bleeding due to gunshot injury, the fortunate results obtained by Keate and Tatum can be but rarely anticipated, though the teachings of Brodie and of Hewett regarding the management of extravasations due to other causes are not invalidated.[2]

Ligations.—In a few cases of gunshot wounds of the head, hæmorrhage was controlled by tying the arterial trunks, with a larger measure of success than attended these operations in wounds of the face (p. 392), neck (p. 419), and spine (p. 456).

Ligations of the Common Carotid.—To arrest bleeding in cases of gunshot fractures of the skull, this vessel was tied seven times. The ligation by Surgeon E. Bentley, U. S. V., to arrest bleeding from the middle meningeal, is noted on page 255. The particulars of six other cases are reported as follows:

Private J. S. Hayden, Co. D, 2d Iowa Volunteers, was wounded at the capture of Fort Donelson, February 14th, 1862, by a musket ball which struck the left ear, carried away the antitragus, perforated the temporal bone, and made its exit at the masseter muscle on the right side, dividing the duct of Steno. He was sent to Third Street Hospital, at Cincinnati, where, on March 2d, in an effort to remove fragments of the petrous bone, there was copious hæmorrhage, which was treated, but not arrested, by the free employment of persulphate of iron. Hæmorrhage recurred on the 8th, and, on March 22d, chloroform was given, and Surgeon John Moore, U. S. A., tied the carotid. Ligature came away on the twelfth day. The patient rapidly regained his strength, and was discharged convalescent July 23d, 1862. He was last heard from in 1868. He had facial paralysis. Professor J. A. Murphy reports the case.

Private John Brooks, Co. I, 57th Pennsylvania Volunteers, aged 17 years, was wounded at the battle of the Wilderness, May 6, 1864, by a conoidal musket ball, which entered over the left ear, passed forwards, making an irregular opening through the temporal bone large enough to admit the introduction of two fingers into the cavity of the skull, and escaped three inches anterior to the wound of entrance The membranes of the brain, however, were not injured. He was treated in a field hospital, and, on May 15th, was sent to the Columbian Hospital at Washington. He was pale, emaciated, and complained of acute cephalalgia; otherwise, his bodily functions were normal. On the 17th, the headache had increased, and the pupils had become contracted. Expectant treatment was used, notwithstanding which, delirium gradually came on, and, on May 20th, the patient was comatose and unable to swallow. The pulsations of the heart were rapid and feeble; the pulse at the wrist, imperceptible. He remained in this condition sixty hours, when it was found that if fluids were placed in his mouth in small quantities, he would swallow them. From this time he slowly improved. On June 2d, the patient was able to sit up, but his bowels were constipated, he voided his urine unconsciously, and his mental faculties were much impaired. He was unable to articulate, had no recollection of the past or proper perception of present things, and stared vacantly round the tent. His appetite was ravenous. The pupil of the right eye did not respond to light; otherwise, there was no paralysis. At this date, a hæmorrhage occurred from the posterior wound to the amount of about two ounces, followed by great improvement in all the symptoms. Hæmorrhage recurred every two or three days, and was not altogether checked until the 18th of June, as it seemed to aid much in restoring

[1] On this subject consult: Colquhoun, G., *De cerebri concussione*, Edinburgi, 1800; Hartman, A. H., *De commotione cerebri*, Gryphiæ, 1846; Lagrange, *De la comm. du cerveau, Thèse de Paris*, 1819, No. 239; Mounier, *De la commotion cérébral, Thèse de Paris*, 1834, No. 119; Repiquet *De la commotion du cerveau, Thèse de Paris*, 1808, No. 36; Bruns, V., *Die chirurgischen Krankheiten und Verletzungen des Gehirns and seiner Umhüllungen*, Tübingen, 1859, Band 1; Gama, *Traité des plaies de tête et de l'encéphalite*, Paris, 1855, 2me édition; Laugier, S., *Dict. de Méd. ou Rép. Gén. des Sci. Méd.*, Paris, 1834, T. VIII, p. 453; Dupuytren, *Leçons Orales*, Paris, 1839, T. VI, p. 170; Mayer, C., *De commotione cerebri*, Berol., 1816; Maler, D., *De commotione cerebri*, Argent, 1777; Fano, *Mémoire sur la commotion* (*Mémoires de la Société de chirurgie de Paris*, 1852).

[2] See Mr. Prescott Hewett's remarks in Holme's *System of Surgery*, 2d ed., 1870. Vol. II, p. 258; Sir Benjamin C. Brodie (*Med. Chir. Trans.* Vol. XIV, p. 385) says: "blood is seldom poured out in any considerable quantity between the duramater and the bone, except in consequence of a laceration of the middle meningeal artery, or one of its principal branches; and it is very rare for this accident to occur, except as a consequence of fracture. If, therefore, we find the patient lying in a state of stupor, and, on examining the head, we discover a fracture, with or without depression, extending in the direction of the middle meningeal artery, although the existence of an extravasation on the surface of the duramater is not thereby reduced to absolute certainty, it is rendered highly probable; and the surgeon, under these circumstances, would neglect his duty if he omitted to apply the trephine; and where no fracture is discoverable, yet, if there is other evidence of the injury having fallen on that part of the cranium in which the middle meningeal artery is situated, the use of the trephine may be resorted to on speculation, rather than that the patient should be left to die without an attempt being made for his preservation."

his mental faculties. On the latter date, an attempt was made to ligate the temporal artery; and this failing, the common carotid was ligated at its upper portion, on June 20th, by Surgeon T. R. Crosby, U. S. V. The bleeding still continuing, the posterior wound was enlarged, and some small fragments of exfoliated bone were removed; the wound was then plugged with lint, which entirely arrested the hæmorrhage. It was estimated that fifty ounces of blood had been lost during the last hæmorrhage. Liberal diet was prescribed, and the patient gained rapidly in flesh. The ligature came away on the tenth day after the operation, and the wound united, except at the point of ligation, where a fistulous opening remained, which discharged daily a small amount of pus. On August 15th, blood was found to ooze from the place of ligation; and, the patient having lost about twenty ounces, the artery was cut down upon by Surgeon Crosby and ligated below the omo-hyoid muscle. The vessel was found dilated to more than double its normal size, and firmly attached to it, on the inner side, was a well-formed clot. Low diet was ordered; tincture of aconite was given to keep the heart's action as much reduced as was consistent with the safety of the patient. On September 15th, the wound had fully healed, and, on November 15th, the patient was furloughed, apparently entirely restored in his bodily functions. He was discharged from service on June 8th, 1865. The case is reported by Surgeon T. R. Crosby, U. S. V., and is figured as No. 284, Surgical Photographs, A. M. M., Vol. VI, p. 34.

Corporal A. J. Peckham, Co. I, 115th New York Volunteers, aged 30 years, received a shot fracture of the occipital, at Cold Harbor, June 3d, 1864, the ball entering at the right of the protuberance, and emerging at the right meatus auditorius. He was conveyed to Alexandria, and, on June 6th, on his admission to 3d division Hospital, in an anæmic state, the wound was swollen from extravasation under the scalp. On the 8th, Surgeon E. Bentley, U. S. V., gave chloroform and ligated the common carotid opposite the thyroid cartilage. The bleeding continued after the operation, and the wound was filled with lint saturated with a solution of persulphate of iron. The patient lingered until June 13th, 1864, and died from syncope.

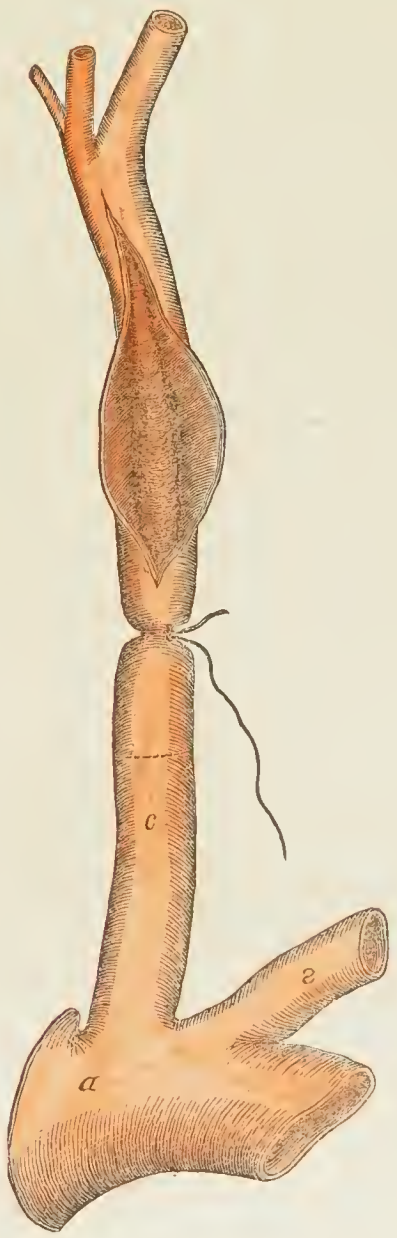

FIG. 1*.—Coagulum in distal portion of the left carotid six days after ligation. *Spec.* 3179, Sect. I, A. M. M.

Private Taylor McIntosh, Co. H, 40th Indiana Volunteers, aged 18 years, was wounded at Mission Ridge, November 25th, 1863, by a conoidal ball, which entered at the centre of the frontal bone, an inch and a half above the supra-orbital ridge, passed through the right orbit, and emerged near the angle of the lower maxilla. He was admitted on the next day to the field hospital of the 2d division, Fourth Corps. He was stupid and had partial convulsions at first, but subsequently regained his senses, although he was still dull and restless. The right eyelid and the right side of the face were swollen and ecchymosed. Cold applications were made to the wound. December 10th, evacuation of abscess in eyelid. By December 15th, he was able to make his wants known and complained of pain in the eye and head. On the 16th, hæmorrhage to the amount of sixteen ounces occurred from the wound of exit; and, on the 17th, the right common carotid artery was ligated above the omo-hyoid on account of the recurrent hæmorrhage. He sank, and died December 19th, 1863, from exhaustion. Surgeon A. McMahon, 64th Ohio Volunteers, reports the case.

Private Hiram B———, Co. A, 142 Pennsylvania, aged 18 years, received a gunshot fracture of the zygoma and mastoid process of the temporal bone, left side, on the Weldon Railroad, August 21st, 1864. He was at once conveyed to the hospital of the 1st division, Fifth Corps, and, on the 24th, was transferred to Lincoln Hospital, Washington. The wound extended from within a half inch of the outer canthus of the left eye to just posterior to the left mastoid process. Cold-water dressings were applied. On the 26th, arterial hæmorrhage occurred, which was checked by filling the wound with lint soaked in a solution of persulphate of iron. It, however, recurred on the next day, and Assistant Surgeon J. C. McKee, U. S. A., administered ether and ligated the left common carotid artery above the omo-hyoid, an inch and a half below the bifurcation. Anodynes and stimulants were administered, but the patient sank under the repeated and copious hæmorrhages, and death ensued September 2d, 1864. At the autopsy, the meatus auditorius was found to be cut across. It was impossible to detect from what artery or arteries the hæmorrhage proceeded. Both lungs were anæmic. The adjoining wood-cut (FIG. 1*) represents a portion of the aorta, the commencement of the left subclavian, the common carotid, and its bifurcation. A firm fibrinous coagulum extends from the seat of ligature to the bifurcation. The coagulum on the proximal side of the ligature is much shorter, occupying less than half an inch. The drawing is of the natural size of the vessels, shrunken in alcohol. The notes of the case, and specimen, were contributed by Acting Assistant Surgeon H. M. Dean.

Private William C. Andrews, Co. A, 30th Iowa Volunteers, aged 19 years, was wounded, by a fragment of shell, in the left temporal region, at Vicksburg, December 28th, 1862. He was treated in a field hospital until January 17th, 1863, when he was admitted to Lawson Hospital, St Louis. On January 18th, hæmorrhage amounting to twelve ounces occurred from the middle meningeal artery, which, all other means failing, was arrested by Assistant Surgeon C. T. Alexander, U. S. A., ligating the left common carotid artery. The hæmorrhage did not recur. Andrews was discharged from the service May 28th, 1863. In March, 1868, he was a pensioner, his disability being rated as total and temporary. Pension Examiner A. C. Roberts, M. D., reports that he had a dizziness and faintness on exertion or stooping, and partial anæsthesia of the left side of the face, being compelled to keep his room in the cold winters of Madison, Iowa, from liability of freezing the left ear and face. Andrews remained in tolerable health on June 4th, 1872, nearly ten years from the date of the operation.

Of the seven operations above referred to, three of the four ligations of the left common trunk were successful, and the three ligations on the right side were fatal—or 57.1 per cent. Among face wounds, fifty-four cases,[1] among wounds of the neck and spine, twenty-three cases, of ligations of the common carotid will be found, or a total of eighty-four operations, with sixty-three deaths, or a mortality of 76.8 per cent.

Ligation of the External Carotid.—One case is reported among the head injuries:

Private Francis L. Whitney, Co. B, 36th Massachusetts Volunteers, aged 24 years, was wounded at the battle of Cold Harbor, June 3d, 1864, by a conoidal ball, which fractured the external angle of the right orbit and the zygomatic arch, passed inward and downward, and lodged behind the right masseter muscle. He was admitted to the hospital of the 2d division, Ninth Corps, and on June 9th was sent to the Emory Hospital at Washington. He had lost considerable blood, was anæmic, comatose, and suffered extreme pain, moaning constantly. Hæmorrhage was arrested by compress to the external carotid, but recurred on the 14th. The patient was placed under the influence of ether and chloroform, when persulphate of iron was applied to the bleeding vessels, and the orifice plugged up with a styptic. The ball could not be found. Hæmorrhage recurred on June 16th, 1864. The external carotid artery was now tied a little above the omo-hyoid muscle, and the ball was extracted from behind the masseter. The man died on the table from nervous exhaustion and anæmia. No anæsthetic had been employed at the second operation. Acting Assistant Surgeon W. A. Ensign, the operator, reported the case.

Ligations of the Superficial Temporal.—This vessel, or its principal branches, was tied twenty-two times for gunshot wounds of the scalp, alone or attended by contusions of bone or cranial fractures. Twenty cases have been enumerated.[2] Two are here noted. Of the twenty-two, two were fatal from hæmorrhage, three from other causes:

Private Robert Faucett, Co. B, 8th Michigan Volunteers, aged 45 years, received a gunshot flesh wound of the scalp, on the right side, at Spottsylvania, May 6th, 1864. On May 19th, there was hæmorrhage from the wound of about three ounces, and, other means failing to control it, Surgeon I. I. Hayes, U. S. V., applied a single ligature to the proximal end of the wounded vessel. The bleeding did not recur, and the man was transferred, convalescent, to Whitehall, whence he was transferred to the Veteran Reserve Corps, January 23, 1865.

Private Josiah Forbes, Co. L, 1st Vermont Cavalry, aged 19 years, received a gunshot scalp wound at Burke's Station, June 24, 1864. The wound became inflamed and irritable and arterial bleeding took place, to arrest which, the right superficial temporal artery was tied, at the Baxter Hospital, Burlington, Vermont, in July. The patient recovered and returned to duty, September 29, 1864. Assistant Surgeon S. L. Thayer, U. S. V., the operator, reported the case.

In connection with wounds of the scalp, an allusion to the custom of North American Indians, of scalping their victims, must not be omitted. This is practiced by making two elliptical, or four straight, incisions in the region of the vertex, and tearing off the ovoid or rectangular portion of integument thus enclosed. This is tanned, with the hair attached, and worn as a decoration. Crushing in the skull with a tomahawk is practiced, unless the vanquished is supposed to be already dead. Mr. T——, a conductor on the Pacific Railroad, while hunting near Cheyenne, in 1869, was attacked by Sioux, scalped, and left for dead. The wound (Fig. 2*) cicatrized in about three months, without exfoliation. The opportunity of skin-grafting was not improved.

Fig. 2*.—Granulating surface a month after evulsion of a portion of the scalp. (From a photograph.)

Foreign Bodies.—Many remarkable instances of the removal of balls[3] and other foreign bodies from under the scalp, or within the cranium, have been recorded.

[1] Dr. Love's ligation of the carotid for bleeding in a wound of the face, fatal from distal hæmorrhage (case of Private *Copeland*, p. 347), is omitted in the summaries on pages 392 and 423, being included in the Statement, p. 394.

[2] Namely, on page 81, successful cases of Private Fuller, Lieutenant Smith, and Corporal Taylor; on page 82, cases of Lieutenant Gilmore, Privates Hartley, Mullen, Reese, Corporals Talmadge, Kullman, and Private D. Jones; also cases of Privates L. Jones, page 83; Newcombe, page 101; Sergeant R. D——, page 160; Private Wheeler, page 225; Private Miller, page 241; Private Allen, page 244; Private Taylor, page 256; Private Bunnell, page 288; Corporal E. Jones, page 298; Private Brooks, page 313.

[3] Since the case of Underwood, p. 281, was put in type, Dr. B. Howard has published (*Am. Jour. Med. Sci.*, October, 1871, N. S. Vol. LXII, p. 385) an extended account of it. He states that he has "hunted up a long list of wonderful recoveries after various injuries of the head," but "has failed to find another case than the above in which a missile out of reach and out of sight has been discovered and removed from the brain by trephining—a permanent recovery afterward resulting." He explains the recovery as due to "neither skill nor attention, but the will of Providence alone."

Fig. 3*.—Portion of bullet extracted from the anterior lobe of the left cerebral hemisphere.—[After Howard.]

Of one hundred and eighty-six cases of balls penetrating the cranial cavity, one hundred and one were fatal; in eighty-five cases of removal, there were forty-three recoveries; of one hundred and one cases in which the foreign body was not removed, fifty-nine were fatal.

Contre-Coup.—Consult the cases on pp. 43, 213, 304, and the authorities in the note.[1]

Trephining.—Besides the two hundred and twenty cases of trephining already printed and enumerated in TABLE VIII, page 309, the nine following observations have been found on miscellaneous papers received since the preceding sections were placed in type:

Private George W. Hamilton, Co. C, 46th Indiana Volunteers, received, at Jackson, Mississippi, July 12th, 1863, a gunshot fracture of the cranium. He was taken to the field hospital, where Surgeon J. L. Dicken, 47th Indiana, performed the operation of trephining. He was afterward treated in the Jefferson Barracks Hospital, and discharged on November 30th, 1863. He did not apply for a pension until February 7th, 1872. Pension Examiner J. M. Justice reports, August 7th, 1872, that Hamilton's disability is one-half and permanent. He also states that the upper portion of the right parietal bone, to the extent of two inches in length and one and a half inches in width, is gone, leaving the duramater exposed.

The following[2] is the only example, that has come to my knowledge, of hyperostosis following gunshot contusions of the cranial bones, as described by Mr. Hewett:

Thomas S——— was struck, at Petersburg, in 1864, by a shell fragment on the right parietal, near the middle of the sagittal suture. There was no marked depression, and the constitutional symptoms were slight and soon abated. Two years afterward he had an epileptic convulsion, which recurred in three months, and then with increasing frequency, until the paroxyms were diurnal. In 1871, Dr. J. T. Gilmore, formerly chief medical officer of the 1st Division of General Longstreet's Corps, determined to trephine. The perforation measured nearly one inch in thickness. Meningitis followed, and was controlled by purgatives, mercurials, and veratrum viride. The patient regained perfect health, and at the end of 1871 epilepsy had not returned.

John Berry, a stout and healthy civilian, at St. Louis, Missouri, on April 27th, 1864, fell from a horse, while in a state of drunkenness, striking his head against a curbstone. Soon after the accident, he was received into the Gratiot Street Hospital. On examination, the wound of the scalp was found to be about two and a half inches in length over the right parietal bone, and the bare bone was detected with some depression. Five days after the injury a trephine was applied, and several pieces of bone were removed. Three days after the operation, erysipelas supervened; for this, tincture of iron, quinine, and whiskey were administered, and the local application of tincture of iodine was used. The patient convalesced rapidly. On May 30th, he was able to walk about town and take full diet. About one month later he was discharged from the hospital. Reported by Surgeon B. B. Breed, U. S. V.

A soldier of the 4th U. S. Heavy Artillery (colored) was struck on the head with a spade, causing a compound fracture of the left parietal bone, with compression of the brain. He was at once carried to the regimental hospital at Columbus, Kentucky. Three hours after the reception of the injury, trephining was performed and the depressed bone was elevated. He was very drowsy for several days after the injury; pupils irregularly contracted and dilated; the pulse at one time falling as low as twenty-seven; there was vomiting, obstinate constipation, and bloody discharge from ears and nose. At date of the report, February 28th, 1864, he was improving. Surgeon James Thompson, 4th U. S. Heavy Artillery, reported the case.

An unknown soldier (German), while engaged in a drunken brawl at Washington, in June or July, 1861, received a blow on the head from the butt of a musket. He was admitted to the Washington Infirmary. Assistant Surgeon J. W. S. Gouley, U. S. A., enlarged the wound, which was linear, and made an incision across it, bringing the fractured left parietal into view. There was apparently but slight depression of the outer table. The inner table proved to be fractured in a stellate form and driven in about one-eighth of an inch. The crown of a large trephine having been applied, a disk of bone, including all the fragments, was removed. The patient had comatose symptoms. As soon as the operation was performed he regained consciousness, but again lapsed into a state of stupor. On the following morning, he answered questions coherently. Recovery took place without further untoward symptoms. Reported by the operator.

Private John H. Miller, Co. I, 134th New York Volunteers, received a blow upon the head at the battle of Gettysburg, July 1st, 1863, from a sword in the hands of his captain. He was taken to the Seminary Hospital, simple dressings applied, and on the 10th sent to Newark, New Jersey, and furloughed August 20th, 1863. While on furlough he came under the treatment of Dr. John D. Wheeler, of West Fulton, New York, who reports some depression of the edges of the fractured bone, which caused compression of the brain and hemiplegia of the right side. The patient had convulsions regularly once a week, and these symptoms becoming more aggravated, on November 24th Drs. Wheeler and S. B. and H. Wells performed trephining. He was discharged from the service May 30th, 1864. He applied for a pension. The Examining Surgeon, Dr J. Neill, reports that there was a deep indentation an inch in diameter along the middle of the left parietal bone, and rated his disability as three-fourths and permanent.

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[1] ARAN, *Recherches sur les fractures de la base du crâne*, (*Archives générales de médecine*, 1844, Tom. VI, 4me serie.); BONETUS, THEOPH., *Sepulchretum lib. IV, Sect.* 3, *observatio X*, Genevæ, 1700; CELSUS, A. C., *De re medica libri octo*, Lugduni, 1592; CHOPART, *Mémoire sur les lésions de la tête par contre-coup*, Paris, 1771; GRIMA, *Mémoire sur le contre-coup*, Paris, 1778; GOUPIL, *Dissertation sur les contre-coups dans les Blessures de la Tête*, Paris, 1815; MÉHÉE, *Traité des lésions de la tête par contre-coup*, Meaux, 1773; SABOURAUX, *Mémoire sur les contre-coups dans les lésions de la tête*, 1778; WAGNER, R., *De contra fissura*, Jena, 1708, *in Haller's Disp. Chir.*, T. I, p. 15; VÉRITÉ, *De la guérison des fractures du rocher, Thèse de Paris.* 1867, No. 59.

[2] GILMORE. *Report of the Surgery of Mobile County for* 1871, p. 31; HEWETT, in Holmes's *System of Surgery*, 1870, Vol. II, p. 248, *Path. Cat.* R. C. S., Vol. II, p. 168., *MSS. Surg. Cat.* A. M. M., *Spec.* 5135, Sect. 2.

Private William H. Edwards, Co. D, 3d Iowa Cavalry, aged 23 years, of good physical condition, was admitted into the hospital at Keokuk, Iowa, January 31st, 1864, with a fracture of the left parietal bone near its eminence, caused by a blow from a navy revolver, at Memphis, January 23d, 1864. He was comatose and delirious; the soft parts were greatly lacerated and contused; there was a slight discharge of pus and blood; there was a circular depression of the fractured bone less than one-half an inch in diameter. The operation of trephining being deemed advisable, Acting Assistant Surgeon D. S. McGuigan made a crucial incision three inches by four and removed three large pieces of depressed bone, measuring from one-half to an inch in diameter, from the inner table, and half an ounce of coagulum situated on the dura-mater. The patient reacted well, with a complete return of all his mental faculties. Occasional epileptic fits followed the operation, and there was copious discharge of laudable pus; on February 20th, hernia cerebri, as large as a hen's egg, appeared; lime-water and chloride of soda were applied without success, and saturated solution of sulphate of iron was substituted; the hernia gradually declined, and he was discharged December 19th, 1864. He applied for a pension, but his claim was rejected. The case is reported by the operator.

Private John McTye, Co. G, 6th Tennessee Volunteers, was struck on the head with a piece of steel, knocked insensible, and robbed, on February 7th, 1863. He was admitted into Hospital No. 1, Murfreesboro', on the same day. The propriety of trephining was considered, but the operation was not performed. He apparently recovered, and the wound gave him no trouble, and on March 23d he was transferred to Hospital No. 23, Nashville, where he was treated for diarrhœa; on April 7th, while applying for a pass, he was suddenly attacked with convulsions, and an examination revealed a depression over the fronto-parietal suture sufficiently large to insert the little finger; after consultation, a T-shaped incision was made, the trephine applied, and three pieces of bone removed. On the 8th, he rested well, pulse 124, tongue slightly colored, and appetite poor; on the 9th, he was very much depressed in spirit; on the 10th, he commenced sinking; the parts around the wound became much swollen, and he died on April 11th, 1863.

Private George Philips, Co. G, 1st Iowa Cavalry, received, at Austin, Texas, December 24th, 1864, a fracture of the left parietal bone, extending from the temporal to the right parietal bone; another fracture parallel to and of equal length, one inch posterior, along the occipital suture of left side; the middle piece of bone was fractured at right angles to the other two at its centre and depressed about three-fourths of an inch. Trephining was performed by Acting Assistant Surgeon John Morris. The compression was relieved. The patient died on the day of injury. The case is reported by the operator.

Of one hundred and ninety-six cases of trephining for the results of gunshot injury, of which one hundred and ten, or 56 per cent., resulted fatally, the dates of operation were accurately ascertained in one hundred and sixty-two. Of these forty-six were primary, ninety-nine intermediary, and seventeen secondary operations. The comparative mortality rates were: primary, thirty-two fatal, or 69.6 per cent.; intermediary, fifty-six fatal, or 56.6 per cent.; secondary, four fatal, or 23.5 per cent. If the thirty-four operations, of which eighteen were unsuccessful, were included in the intermediary and secondary groups, where they probably belong, the differences in favor of the latter operations would be diminished, but not removed.[1]

As to the degree of fatality according to the part of the cranium perforated, the results of one hundred and fifty-two operations for the effects of shot fractures limited to one cranial bone, give the following results: trephining of parietal in eighty-five cases,

[1] ARNEMANN, D., *Bemerkungen über die Durchbohrung des processus mastoïdeus in gewissen Fällen der Taubheit*, Göttingen, 1792; BREYER, F., *De trepanatione cranii in morbis capitis*, Tubingæ, 1831; BILLROTH, TH., *Historische Studien über die Beurtheilung und Behandlung der Schusswunden vom 15, Jahrhundert bis auf die neueste Zeit*, Berlin, 1859, p. 29; BARET, P. G., *Essay sur la nécessité de l'opération du trépan dans les plaies de tête par armes à feu*, Paris, 1815; BERLIN, A., *De cranii trepanatione quædam*, Berolini, 1828; CELINSKI, *De trepanatione cranii, Diss.*, Berolini, 1833; CONSTATT, R., *Nonnulla de terebratione cranii læsionibus capitis adhibenda*, Vratislaviæ, 1865; DALE, T. F., *Depressed Fracture of the Cranium successfully treated, North Am. Med. and Surg. Jour.*, Vol. X, p. 164; DORSEY, J. S., *Fracture of the Skull and Wound of the Brain, Phila. Med. Museum*, Vol. II, p. 282, 1806; FLOURENS, *Considérations sur l'opération du trépan*, Paris, 1830; FISCHER, H., *Klinisches und experimentelles zur Lehre von der Trepanation*, Berlin, 1865; GUILD, J., *Case of Epilepsy cured by Trephining, Am. Jour. Med. Sci.*, Vol. IV, p. 96, 1829; HECKERT, C. A., *De trepanatione adjectis observationibus hue spectantibus*, Diss., Wirceburgi, 1826; HAYWOOD, G., *Epilepsy successfully treated by Trephining, Am. Jour. Med. Sci.*, Vol. XXII, p. 517, 1838; HOLSTON, J. G. F., *Trephining for Epilepsy, Am. Jour. Med. Sci.*, Vol. XVII, p. 541, 1849; JUDKINS, W., *Chronic Injuries of the Brain relieved by an Operation with the Trephine, Transyl. Med. Jour.*, Vol. II, p. 135, 1829; KAUZMANN, M. E., *De novo trepanationis instrumento*, Diss., Erlangen, 1802; KERNER, TH., *De perforatione capitis*, Vratislaviæ, 1856; LEFORT, *De l'utilité et des indications de la trépanation du crâne dans les lésions traumatiques de la tête (Gaz. Hebd.*, 1867, Nos. 19, 20, 24); LUDWIG, G. F., *De novo trepano præcipue pro orbitæ vulneribus atque de indole morborum vernalium*, Tübingæ, 1811; LE BRUN'A, *Biblioteka umiejetnosci lekarskich, Chirurgia Operacyjna*, Warzsawa, 1868; LARREY, M. H., *Etude sur la Trépanation du crâne dans les Lésions traumatiques de la tête*, Paris, 1869; LOUVRIER, J., *Abhandlungen über die Durchbohrung des Schädels*, Wien, 1800; LAUFFS, J., *De variis trepanationis methodis*, Berolini, 1826; LEISNIG, A. F., *Über Trepanation*, Würzburg, 1844; MALAVAL, *Préeis d'obs. sur le trépan in Mém. de l'Ac. roy. de chir.*, 1743; MOTT, V., *Memoir on the Subsequent Treatment of Injuries of the Head, Trans. Physico-Med. Soc. of New York*, Vol. I, p. 223, 1817; NESEMANN, R., *De terebratione cranii in lesionibus capitis adhibenda*, Vratislaviæ. 1858; NORRIS, G. W., *Report of Cases of Injuries of the Head, Am. Jour. Med. Sci.*, Vol. IX, p. 304, 1831; PARK, A., *Fractured Skull successfully trephined, Chapman's Phila. Med. Jour.*, Vol. VIII, 1824; RICHTER, C. A., *Über Kopfverletzungen und die Trepanation*, Tübingen, 1863; ROSER, W., *Zur Trepanationslehre*, in pamphlets, v. 224; ROGERS, D. L., *Epilepsy from Depressed Bone, cured by Trephining, N. Y. Med. and Phys. Jour.*, Vol. V, p. 79, 1826; ROLAND, *De trapanatione cranii*, Berolini, 1844; TEXTOR, C., *Über die Nichtnothwendigkeit der Trepanation bei Schädeleindrücken*, Würzburg, 1835; VELPEAU, *Plaies de tête, De l'opération du trépan*, Paris, 1854; VROLICK, *Bemerkungen über die Weisse, wie die Oeffnung in dem Schädel, nach der Trepanation, oder anderem Knochenverlust, ausgefüllt wird*, Amsterdam, 1837; WAREINSHEIN, *Thèse de Paris*, 1861, No. 58, *Du trépan en Angleterre*; WIRMANSKI, J., *De cranii trepanatione*, Berolini, 1831; WEEDS, J. F., *Case of Cerebral Abscess, Nashville Jour. of Med. and Sci.*, April, 1872.

forty fatal, or 47.1 per cent.; forty-six of frontal, twenty-seven fatal, or 58.7 per cent.; twelve occipital, six fatal, or fifty per cent.; nine temporal, three fatal, or 33.3 per cent.[1]

Hernia cerebri.—Sixty-one cases were reported, with eleven recoveries.[2]

The varieties in form of fractures produced by falls, blows with various blunt weapons, small and large projectiles, are usually, but not invariably, sufficiently distinctive to be recognized. The sword incisions, which cannot strictly be called fractures, though I have thus classified them (See PLATE II and FIGS. 1, 2, 3, 5), bayonet punctures (FIG 8), fissures from falls on the vault (FIGS. 12 and 14), are characteristic; the fractures caused by blows often map out the form of the weapon (FIGS. 15, 21, 24), as in the calvaria represented by FIG. 5*. The clean perforations made by small projectiles striking the skull perpendicularly at close range (see *Circular* 3, S. G. O., 1871, FIGS. 4 and 5), contrast with the irregular fractures produced by the oblique impact of the same projectiles with lower velocities, and with the effects of shell fragments (FIGS. 146 and 148). The adjoining cut (FIG. 4*) represents a calvaria contributed by Surgeon J. T. Hodgen, U. S. V.,—case of Private James M———, 24th Texas Cavalry, wounded by a shell fragment at Arkansas Post, January 22d, 1863, with injury of dura-mater; died February 8th, 1863. FIGURE 6* represents a pistol ball perforation at close range (see *Catalogue of the Surgical Section of the Museum*, page 25). It is a popular notion that leaden balls sometimes flatten against the skull without fracturing it. This is probably erroneous. There is great variety in the malleability of the lead used for projectiles; but the momentum necessary to produce flattening in the softest will generally suffice to overcome the resistance of the hardest bone. The projectile represented in the cut (FIG. 7*) weighed only thirty grains, but fractured and depressed the frontal bone.

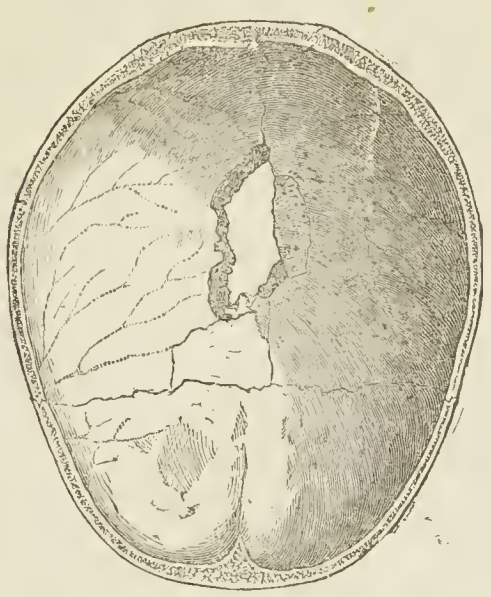

FIG. 4*.—Calvaria, showing a shell fracture near the vertex. *Spec.* 1013, Sect. I, A. M. M.

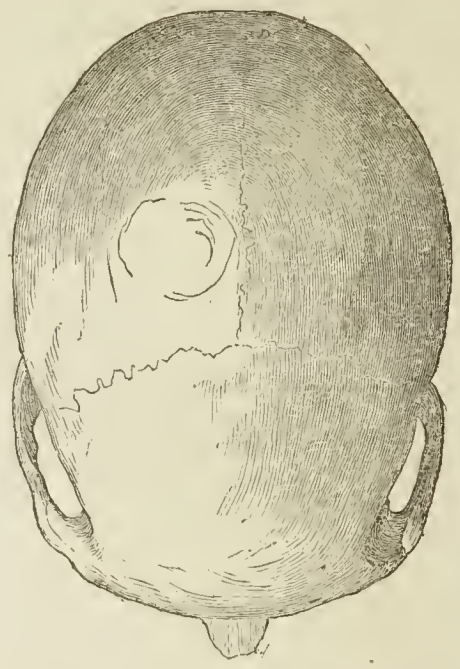

FIG. 5*.—Skull of a Pampa Indian fractured by the bolas, a ball attached to a cord, a Patagonian weapon. *Spec.* 972, Sect. I, A. M. M.

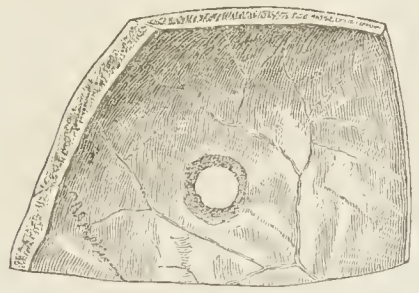

FIG. 6*.—Internal view of segment of left parietal perforated by a pistol ball, the inner table beveled, but not fissured. *Spec.* 3220, Sect. I, A. M. M.

FIG. 7*.—Buckshot flattened on the frontal bone. *Spec.* 4473.

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[1] In the surgical report in Circular No. 6, S. G. O., 1865, page 16, I stated that "Surgeon D. W. Bliss, U. S. V., alone has reported eleven successes after the use of the elevator or trephine." It is true that Dr. Bliss has reported eleven cases, but I find on examining them that his success, though gratifying, was not uniform. Doubtless his success was overestimated, as, subsequently, in regard to the efficacy of cundurango in cancer, from reporting cases before the cures were confirmed. He had eleven cases of trephining, with six recoveries, viz: 1. R———, p. 59; 2. Morton, p. 125, fatal; 3. P———, p. 266, fatal; 4. E———, p. 268, fatal; 5. Clark, p. 269, fatal; 6. L———, p. 272, fatal; 7. D———, p. 277; 8. E———, p. 278; 9. G———, p. 278; 10. S———, p. 281; 11. Wolfe, p. 283; besides four cases of removal of fragments, namely: 1. Wagner, p. 238; 2. N———, p. 248, fatal; 3. McConnville, p. 255, fatal; 4. Kennedy, p. 294, or fifteen cases, with eight recoveries.

[2] ABERNETHY, *Surgical Works*, Vol. II, 1830, p. 51; ALLEN, J. A., *Fungus cerebri successfully treated by Excision, New England Med. Jour.*, Vol. VIII, p. 323, 1849; BUCK, G., *Researches on Hernia Cerebri following Injuries of the Head, N. Y. Jour. Med. and Surg.*, Vol. IV, p. 348, 1840; CORVINUS, J. F. C., *De hernia cerebri*, Argentorati, 1749; DETMOLD, W., *Abscess in the Substance of the Brain; Hernia Cerebri, the Lateral Ventricles opened by an Operation, Am. Jour. Med. Sci.*, Vol. XIX, p. 86, 1850; HENNEN, *op. cit.*, 3d ed., p. 316, Case XLVII; HEUSTIS, J. W., *Case of Hernia cerebri cured, Am. Jour. Med. Sci.*, Vol. III, p. 350, 1829; HILL, J., *Cases in Surgery*, Edinburgh, 1872, p. 64; LOUIS, *Sur le tumeur fongeuse de la Dure Mère, Mém. de l'Acad. Royal de Chirurgie*, Nouv. éd., Paris, 1819, T. V, p. 9; SOLOMONS, *De cerebri tumoribus*, Diss., Edinburgh, 1810; STANLEY, *Cases of hernia cerebri, in Med. Chir. Transactions*, Vol. III; HELD, *De hernia cerebri*, Diss., Giessæ, 1777.

The closure of the orifice made by the trephine is generally completed by the formation of a tough fibroid substance, with scanty, if any, deposition of callus. Hence the old surgeons used to protect these apertures by a metallic or leathern disk. The destruction of the pericranium and injury to the duramater is assigned by physiologists as the cause of the absence of callus formation. The practical corollary is that it would be well to reflect, and preserve the pericranium over the space interested by the crown of the trephine. Klenke[1] reports cases in which these membranes were preserved and the bone was regenerated. The Museum can add one instance to the rare observations of the appearances of the perforations in the skull in those who have long survived trephining:

A son of J. H. W———, of Washington, a precocious lad of about twelve years, received, in 1842, a compound depressed fracture of the right side of the frontal bone, caused by a blow from a stone. The integuments were drawn together by adhesive strips, and absolute rest, low diet, and confinement in a dark room were enjoined by his medical attendant, Dr. Thornton. He recovered apparently without any untoward systoms; but a few weeks afterward, Dr. Borrows was called to see him on account of an epileptiform convulsion. This was ascribed to gastric derangement, and was treated as an ordinary fit. A few months after convulsions recurred, and continued with periodicity weekly. Fully three months now elapsed before any other sign of cerebral disorder was manifested. At last there was dulness of mind, vertigo, and greater frequency in the recurrence of the spasms. About three years after the accident, Dr. Nathan R. Smith trephined at the depressed part. The youth was comparatively well for six months afterward, when epilepsy recurred, and he gradually became idiotic. He lived till 1863. Physically he was well developed. These reminiscences of the case were furnished orally by Dr. Joseph Borrows. The specimen was contributed by Professor Johnson Elliot, of the Georgetown Medical College. The trephine aperture is 0.625 inches in diameter, and is closed by a tough diaphanous membrane, having a tendinous lustre, and appearing under the microscope as formed of layers of superimposed horny epithelium. There is a falciform projection from the posterior surface of the membrane, which must have pressed upon the cerebral mass. No notes of the autopsy were preserved.

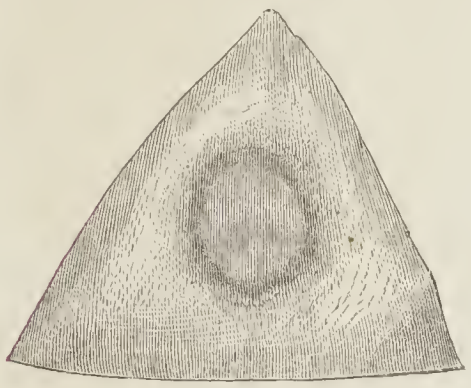

FIG. 8*.—Exterior view of trephine orifice eighteen years after operation. *Spec.* 5024, Sect. I, A. M. M.

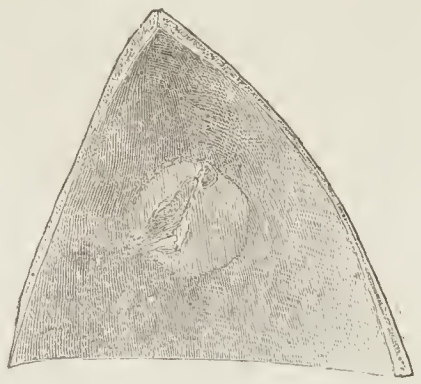

FIG. 9*.—Interior view of same specimen, showing the fibroid septum, with its falciform projection.

Surgeon Andrews,[2] 1st Illinois Light Artillery, differs from Guthrie, and from the opinions commonly accepted, in regarding wounds of the anterior lobes as less, instead of more, fatal than those of other parts of the brain.

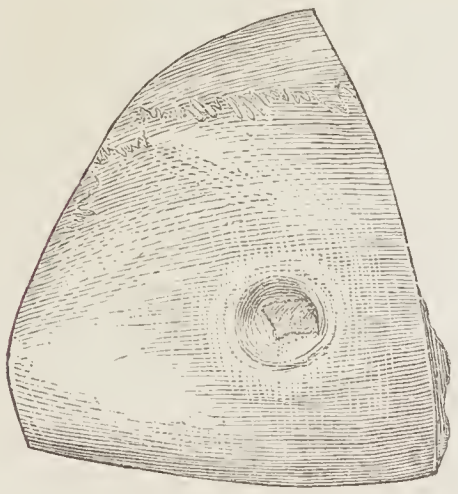

FIG. 10*.—Exterior view of a segment of the right side of the frontal bone, deeply indented. *Spec.* 2619, Sect. I, A. M. M.

Opportunities of examining the repair of depressed fractures of the skull, after the lapse of many years, are not very common. Hence the interest attaching to the specimen represented by the wood-cuts (FIGS. 5* and 6*). The case is reported on page 165 *ante*, and the specimen is described at page 10 of the Catalogue of the Surgical Section of the Museum.

FIG. 11*.—Interior view of the foregoing specimen. *Spec.* 2619, Sect. I, A. M. M.

[1] WAGNER (*Über den Heilungsprozess nach Resection und Extirpation der Knochen*, Berlin, 1853, S. 23) refers to the paucity of notices of dissections of persons who have survived trephining for a long period. Consult DUBREUIL (*Presse Médicale*, 1837); GUENSBURG (*Deutsche Klinik*, 1850, No. 8); KLENKE (*Physiologie der Entzündung und Regeneration in Organischen Geweben*, Leipzig, 1842, S. 197); ROKITANSKI (*Lehrbuch der Pathologischen Anatomie*, Wien, 1855, B. I, S. 179); JAMESON, *Case in which the Osseous Disk, removed by trephine, was regenerated, Maryland Medical Recorder*, Vol. I, p. 152, 1829; HUNAULD, *Sur les os du crâne de l'homme in Mém. de l'Acad. des Sciences*, 1730; VÉRITÉ, *De la guérison des fractures du rocher, Thèse de Paris*, 1867, No. 59; OLLIER, *Traité expérimental et clinique de la régénération des os*, Paris, 1867; VICAROUX, *Opuscule sur la régénération des os*, Paris, 1788.

[2] ANDREWS (*Complete Record of the Surgery of the Battles fought near Vicksburg, December 27th, 28th, 29th, and 30th*, 1862, Chicago, 1863, p. 32) relates five cases of cranial fracture with the following comments: "Of these five fractures two were from bullets penetrating the brain and three from pieces of shell or oblique bullets. They all died, without exception; only one was trepanned, and he without benefit. The general result in military surgery is that gunshot fractures of the cranium are fatal, and that trepanning is very seldom useful. A few unrecorded cases of recovery, however, came to my knowledge, and it is worthy of notice that these were, without exception, wounds of the anterior lobe of the brain, which, for some reason, seems to sustain injury with less mortality than any other part."

FIG. 12*.—Holston's chisel.

Brevet Lieutenant Colonel J. G. F. HOLSTON, Surgeon U. S. V., Professor of Anatomy of the Georgetown Medical College, gives the following views of operative interference in wounds of the head: "I will briefly state my views of trephining under the three heads of primary, intermediary, and subsequent operations. Primary operations are indicated: 1st. Where the scalp is wounded and the subjacent bone broken in, so as to press upon a portion of the brain that cannot be relieved in any other way; for, in this case, the brain has already suffered and will suffer still further injury, if not relieved: commonly, some portions may be picked away by the forceps, so as to render the operation of trephining unnecessary, as by means of the lever the depressed bone may be elevated. In these cases, it has been my practice to remove *all* depressed bone, a little more or less making no difference. I have preferred the chisel for such removal, as the sharp edge of the chisel will cut cleaner and with less irritation than the saw, the teeth of which tear the tissues, and give almost as much shock for every tooth, as the chisel and mallet do at every blow. The chisel I have had made by Tiemann, is of the form indicated (FIG. 12*), the projecting blunt tooth of the cutting edge pressing aside the duramater and preventing injury to this structure. 2d. Where a missile, clothing, etc., had entered the brain, and by cautious sounding detected near the orifice. Where they are not so found, I should make no curious explorations of the interior of the cranium, believing that the patient may be more severely hurt by the exploration than by the original injury. I should content myself in such cases by removing all extraneous spiculæ of bone and other detrimental matter that may be about the orifice of the wound. 3d. Where there is no external wound, but evidently a large compression of bone on the brain. If symptoms of compression are gradually *deepening*, there can be no doubt but we should relieve the brain of pressure; in this case, probably blood has been poured out from one of the meningeal arteries. I consider such operations intermediary as are performed on the patient before he has recovered from the immediate injury inflicted. These operations are by no means as successful as the first, and are generally done in such cases as have not had proper attention. But there is one condition, which happens occasionally, where a certain part of the skull has been struck without external wound, or without any sign of compression coming on immediately. After several days, coma begins to manifest itself, and here we have probably to deal with suppuration; which, if not speedily provided with an outlet, will sink deeply. Subsequent operations are such as are performed for the removal of some difficulty left behind, such as epilepsy, paralysis, etc. I have four times successfully operated on epileptics. The patients all recovered of the operation, and all were cured of the epilepsy. As regards success, I would reckon first the subsequent, next the primary, and, lastly, the intermediary operations, which are least successful of all. These are the rules that guide us in private practice, but I found in my experience in the Army that they did not hold good. The injuries of the head are there so much more violent, that I am inclined to think no intervention to be the safer practice. I believe I have seen more injuries of the head recover without trephining than with, so that it is an open question with me, whether trephining should not be either entirely abandoned, or left to the judgment of one specially qualified in the matter. In private practice, the trephine is as successful as other operative proceedings."

NOTE.—The following authorities may be consulted on Wounds and Injuries of the Head: ANDRAL, *Clinique de la Charité*, Tom. V; BAUCHET, *Des lésions traumatiques de l'encéphale. Thèse de concours pour l'agrégation*, Paris, 1860; BAUDENS, M. L., *Clinique des plaies d'armes à feu*, Paris, 1836; BÉGIN, *Eléments de Chirurgie*, Paris, 1858, Tom. II; BELL, B., *System of Surgery*, Vol. III, 1785; BERCHON, *Observations remarquables de fractures du crâne. (Butletin de la Société anatomique*, 1865); BERENGER DE CARPI, *De fractura cranii*, 1529; BICHAT, *Mémoire sur les plaies de la tête*, Paris; BOHN, *De renuntiatione vulnerum*, Lipsiæ, 1711; BOINET, *Des signes immédiate de la contusion du cerveau. (Archives générates de médecine*, 5me série, Tom. II et III, 1837); BOIREL, *Traité des plaies de tête*, Alençon, 1677; BOTALLUS, L., *Op. Omnia, de Vulner. sclop*, 1582; BOYER, *Maladies Chirurgicales*, Tom. IV, 5me edition; BRIOT, *Histoire de l'État et des Progrès de la Chirurgie Militaire en France*, Besançon, 1817; BRODIE, SIR BENJ., *On Injuries of the Head*; BROWNSCHWEIG, *Dis ist dat Buch der Cirurgia Handwuerckung der Wundtartznei*, Strassburg; CASPARI, *Die Kopfverletzungen*, Leipzig, 1823; CHASSAIGNAC, *Des lésions traumatiques de l'encéphale. (Thèse pour le concours d'agrégation en chirurgie*, Paris, 1842); CHAUVEL, *Des fractures du crâne (Thèse de Paris*, 1864, 124); COLLES, *Practical Precepts on Injuries of the Head*, Dublin, 1814; COOPER, SAMUEL, *Dict. of Pract. Surg.*, 7th and 8th editions, 1838 and 1869; COOPER, Sir A., *Lectures on the Principles of Surg.*, Vol. I, London, 1824; DEASE, *Observations on Wounds of the Head*, 1776; LAMOTTE, *Traité complet de chirurgie*, Tom. II, Paris, 1722; DENONVILLIERS, *Compendium de chirurgie*, Tom. II, Paris, 1864, *Thèse de concours pour l'agrégation*, Paris, 1859; DESAULT, *Œuvres Chirurgicales*, Tom.II; DESPORTES, *Plaies d'armes à feu*, Paris, 1749, p. 388; DE VIGO, JOHN, *Practica in arte chirurgica copiosa*, Rom, 1514; DIONIS, *Cours d'opérations chirurgicales*, 4me édition, 1740; DUCHESNE, JOSEPH, *Sclopetarius*, Lugdun, 1576; DUPRÉ DE L'ISLE, *Traité des lésions de la tête*, Paris, 1770; EICHORN, W., *De capitis lasionibus*, Erlang, 1815; ELTZE, *Diss. de fract. basii cranii*, Berlin, 1826; FABRICE D'AQUAPENDENTÉ, *Œuvres chirurgicales*, Lyon, 1674; FABRICIUS HILDANUS, *Observations Médico-chirurgicales*, cent. 6; FERRI ALPHONSO, *De Tormentariorum sive Archibusorum vulnerum et cura*, Rom, 1552; GAMA, *Traité des plaies de tête et de l'encéphalite*, Paris, 1855, 2me édition; GARENGEOT, *Operations chirurgicales*, Tom. III, 1751, 2me édition; GÉRARD, *Thèse de Strasbourg*, 1802; GERSDORF, *Fetdbuch der Wundtartznei*, Strassburg, 1517; GOOCH, B., *Cases and Practical Remarks in Surgery*, London, 1758; GUILLEMEAU, *Œuvres de chirurgie*, 1649; GUTHRIE, *On Injuries of the Head*, London, 1842; HALLER, *Disputationes chirurgicæ selectæ*, Tom. I, Venetiis, 1755; HENNEN, *Op. cit.* p. 281; HEWETT, P., *Lectures on Injuries of the Head, Medical Times and Gazette*, Vol. II, 1855, *and Med. Chir. Trans.* Vol. XXXVI, 1853; HILDANUS, *Centuria* 2, *Observat.* 2, p. 77; HILLS, *Cases in Surgery*, 1762; HIPPOCRATES, *De Vulneribus capitis*, 1578; JOLIEU, *Doctrine des anciens sur les plaies de tête (Thèse de Paris*, 1811); LARREY, *Clinique chirurgicale*, Tom. I et V; LAURIOL, *Considerations sur les fractures de la base du crâne (Thèse de Montpellier*, 1851, 99); LEDRAN, *Observations de chirurgie*, Tom. I, 1751; LOMBARD, *Remarques sur les lésions de la tête*, 1796; LOSIUS, *Observ. Medic.* 1, lib. 1; MAGATUS, *De rara medicatione vulnerum*, Venetiis, 1676; MALGAIGNE, *De la théorie et du traitement des plaies de tête (Gazette médicale*, 1836); MANNE, *Obs. de chir. au sujet d'une plaie à la tête*, Avignon, 1729; MARCHETTIS, *Observationum medico-chirurgorum radorum sylloge*, Amstelodam, 1665; MARCHAL DE CALVI, *Annales de la chirurgie*, Paris, 1842, Tom. V; MARJOLIN, *Dict. en* 30 *vol. (tête)*, 1844; MASLIEURAT-LAGÈMARD, *Ecchymoses palpébrales et orbitaires (Archiv. génér. de médecine*, 1841, Tom. XI, 5me série); MATZGER, *De læsionibus capitis*, 1774; MICHEL, *Thèse de Paris*, 1854, No. 95, *Quelques considérations sur le crâne surtout au point de vue des fractures*; MINDERER, *Medicina militaris seu libellus castrensis*, Augsburg, 1620; NOUHAULT, *Traités des Plaies de Tête*; OCHWADT, *Kriegs-chirurgische Erfahrungen auf dem administrativen und technischen Gebiete während des Krieges gegen Dänemark*, Berlin, 1865; PARÉ, *Œuvres complètes*, Tom. II, Édition Malgaigne, 1840; PETIT (J. L.), *Œuvres chirurgicales*, Tom. I, p. 43, 1774; PERCY, *Manuel de Chirurgien d'Armée*; PLATNER, *Institutiones chirurgicæ*, Lipsiæ, 1745; POTT, P., *Obs. on the Nat. and Con. of Wounds and Cont. of the Head*, London, 1760; QUESNAY, *Mém. de l'Acad. de chirur.*, 1743; RANBY, *Method of treating Gunshot Wounds*, London, 1744; RICHET, *Anatomie médico-chirurgicale*, Paris, 1860; ROUHAULT, *Traité des plaies de tête*, Turin, 1720; SAUCEROTTE, *Mém. de l'Acad. de chirur.*, Tom. III; SAVIARD, *Nouveau recueil d'observations chirurgicales*, Paris, 1702; SCHMIDT, *Kopfverletzungen*, Hamburg, 1838; SCULTETUS, *Armamentarium Chirurgicale*, 1593; SCHMUCKER, *Chirurgische Wahrnehmungen*, Berlin, 1759; SERRES, *Annuaire médico-chirurgical des hôpitaux*, 1849; SHARP, W., *Practical Observations on Injuries of the Head*, London, 1841; TEUBELER, *De vulneribus cerebri non semper tethalibus*, Halle, 1760; TULPIUS, N., *Observationes Medicæ*, Lugduni, Bat., 1716; VAN SWIETEN, *Boerhaavi aphorismi*; WEPFER, J. J., *Observationes de affect. capitis*, Scaphusii, 1727; YONGE, *Wounds of the Brain proved curable*, London, 1682.

CHAPTER II.

WOUNDS AND INJURIES OF THE FACE.

The number of cases reported of wounds and injuries of the face that came under treatment was nearly ten thousand, or a proportion of rather more than three-fourths, as compared with the lesions of the cranium and its soft parts. It will be unnecessary to discuss the wounds of the face in such detail as those affecting, or liable to affect, the brain, injuries of the head affecting the brain having been already fully considered. The chapter will be divided into three sections; the first devoted to the incised, punctured, lacerated, and miscellaneous wounds, the second to gunshot wounds, and the third to plastic operations for deformities resulting from wounds and injuries of the face.

Section I.

INCISED WOUNDS, CONTUSIONS, AND MISCELLANEOUS INJURIES.

The cases grouped under this heading number several hundreds; but few are reported sufficiently in detail to possess much surgical interest. The most serious cases referable to this class were the burns and scalds, which will be separately considered in a future chapter. The instances of sabre and bayonet wounds will be enumerated, and a tabular statement of the other cases belonging to this Section will be given.

Sabre-cuts.—Thirty-seven cases of sword wounds of the face were reported In four instances only were the facial bones incised or denuded, and but a single case had a fatal result. There was no example of grave injury to the vessels or nerves. Twenty-eight of the thirty-seven wounded men were returned to duty at intervals of from one to one hundred and eighty days. Three patients were discharged, one was sent to the provost marshal for exchange, one deserted, one died, and three are not accounted for.

BARNETT, ROBERT, Private, Co. F, 6th United States Cavalry, aged 34 years. Mower Hospital. Duty, September 13th, 1863.

BRAND, ADAM, Private, Co. C, 4th New York Cavalry. Aldie Gap, June 17th, 1863. Alexandria Hospital. Duty, June 29th, 1863.

BROWN, CHARLES, Sergeant, Co. F, 9th New York Cavalry. Rappahannock River, October 11th, 1863. Regimental hospital. Duty, October 11th, 1863.

BUSHMAN, HENRY, Private, Co. B, 8th New York, aged 22 years. Bull Run, July 21st, 1861. Duty six months after injury.

CARTER, CORNELIUS, Corporal, Co. C, 4th Iowa Cavalry. Hospital steamer, Jefferson Barracks, and Keokuk hospitals. Duty, March 9th, 1864.

COMSTOCK, MARK, Private, Co. L, 1st United States Cavalry. Upperville, June 21st, 1863. Emory Hospital. Duty, July 3d, 1863.

DRAKE, WILLIAM H., Private, Co. A, 6th Ohio Cavalry. Upperville, June 21st, 1863. Field and Emory hospitals. Duty, July 13th, 1863.

FINK, MICHAEL, Private, Co. B, 1st Potomac Home Brigade, aged 45 years. Frederick, March 24th, 1864. Frederick hospital. Duty, April 2d, 1864.

FLYNN, ANDREW, Private, Co. A, 6th Michigan Cavalry, aged 32 years. Gettysburg, July 2d, 1863. York hospital. Duty, December 4th, 1863.

FREEMAN, MOSES H., Private, Co. G, 6th Ohio Cavalry. Upperville, June 21st, 1863. Emory Hospital. Duty, November 27th, 1863.

HAYNES, WILLIAM G., Private, Co. B, 13th Indiana. Dessert Mountain, Virginia, January 30th, 1863. Regimental hospital. Duty, April 23d, 1863.

JONES, SAMUEL D., Private, Co. G, 2d Massachusetts Cavalry, aged 28 years. Gainesville, Virginia, May, 1864. Alexandria hospital. Duty, August 1st, 1864.

KELLY, THOMAS J., Corporal, Co. K, 6th Michigan Cavalry, aged 21 years. Trevillian Station, June 11th, 1864. Field and Mount Pleasant hospitals. Duty. September 13th, 1864.

MANDEL, FREDERICK, Quartermaster Sergeant, Co. E, 2d Virginia Cavalry, aged 31 years. Harper's Farm, April 6th, 1865. Field and Annapolis hospitals. Duty, April 26th, 1865.

MCDONALD, WILLIAM, Private, Co. H, 148th Pennsylvania. Wounded by an officer, October 19th, 1863. Regimental hospital. Duty, November 6th, 1863.

NEWHALL, WALTER J., Captain, Co. A, 3d Pennsylvania Cavalry. Gettysburg, July 1st, 1863. Duty.

NORTHWAY, DELOS R., Captain, Co. A, 6th Ohio Cavalry. Aldie, Virginia, June 17th, 1863. Duty.

RINGER, JACOB A., Sergeant, Co. A, 50th Ohio, aged 37 years. Chattanooga, October 8th, 1864. Nashville, Louisville, and Madison hospitals. Duty, February 17th, 1865.

Rodgers, William C., Private, Baltimore Battery. Moorfield, August 7th, 1864. Sabre-cut of face, with injury of nasal bones. New Creek hospital. Transferred to post commander, August 25th, 1864.

SIMON, LYON B., Private, Co. I, 18th Pennsylvania Cavalry, aged 25 years. Gettysburg, July 1st, 1863. York Hospital. Duty, December 15th, 1863.

SNYDER, M. B., Sergeant, Co. F, 6th Pennsylvania Cavalry, aged 26 years. Near Culpeper, August 1st, 1863. Washington hospital. Duty, September 30th, 1863.

STOKES, FRANCIS, Sergeant, Co. A, 72d Indiana Mounted Infantry. Atlanta, 1864. Duty, five weeks after injury.

STRAUS, CHARLES, Private, Co. H, 5th New Jersey. Rappahannock, January, 1863. Also gunshot wound of leg. Returned to duty.

TEMPEST, MARTIN, Private, Co. A, 8th Indiana Cavalry, aged 28 years. Cuyler Hospital. Duty, March 13th, 1865.

THORNE, GEORGE H., Private, Co. H, 26th Massachusetts. June 30th, 1863. Barracks, New Orleans. Duty, October 17th, 1863.

TOMPKINS, AARON B., 1st Sergeant, Co. G, 1st New Jersey Cavalry, aged 21 years. Amelia Springs, April 5th, 1865. Field and Annapolis hospitals. Duty, May 8th, 1865. Three wounds.

WELTON, JOHN A., Corporal, Co. D, 4th Pennsylvania Cavalry. Upperville, June 21st, 1863. Field and Emory hospitals. Duty, August 13th, 1863.

WILLIAMS, JOHN, Private, Co. F, 3d Wisconsin Cavalry, aged 27 years. Madison, July 30th, 1864. Harvey Hospital. Duty, March 2d, 1865.

Three patients appear to have been more seriously hurt, and were discharged :

TODD, RICHARD, Private, Co. A, 59th New York. Cold Harbor, May 31st, 1864. Sabre-cut, taking off half of nose; also, shell wound of mouth, and gunshot wound of thigh. Discharged from service August 15th, 1864.

WAFFLE, ALLEN, Private, Co. M, 3d New York Light Artillery, aged 20 years. Accidental. April 5th, 1865. Sabre-cut left eye. Field and Patterson Park hospitals. Mustered out May 27th, 1865.

DURBIN, JOHN, Private, Co. C, 18th Pennsylvania Cavalry, aged 36 years. Hanover Junction, June 30th, 1863. Sabre-cut of face, near outer canthus of right eye, causing loss of sight of right eye, and sympathetic affection of left eye. Field, McKim's Mansion, Cuyler, and Satterlee hospitals. Discharged from service June 6th, 1865.

In the following case of a Confederate prisoner, the patient recovered and was released:

Kissick, Henry, Private, Co. C, 2d Kentucky Cavalry, aged 31 years. Cynthiana, June 12th, 1864. Covington hospital. Military prison, June 27th, 1864.

In two other cases of this category, one patient deserted and one died:

Watson, William, Private, 9th Indiana Cavalry, aged 49 years. April 9th, 1864. Indianapolis hospital. Deserted May 7th, 1864.

Martin, J. W., Private, Co. D, 6th Virginia. Sabre-cut of cheek, through zygoma. Richmond hospital. Died June 30th, 1862.

In the three following cases, the terminations cannot be ascertained:

Lawson, John C., Private, Co. E, 6th Ohio Cavalry. Raid in Virginia, May, 1864. Field hospital. Termination unknown.

Pike, Philip C., Private, Co. A, 1st Alabama Cavalry. Campaign in North and South Carolina, between January 28th and March 22d, 1865. Severe sabre-cut of face. Field hospital. Termination unknown.

Clark, Nelson, Private, Co. F, 122d Ohio. Manchester, Virginia. Sabre-cut of left side of face, about one-half inch external to angle of mouth. Termination unknown.

Bayonet Wounds.—Twenty-seven cases of bayonet wounds of the face were reported. Eleven returned to duty, eleven were discharged, one died, and four of the wounded were not accounted for:

Alvis, John, Corporal, Co. B, 28th United States Colored Troops, aged 21 years. Petersburg, October 27th, 1864. Punctured wound; loss of right eye. Field and Alexandria hospitals. Discharged June 10th, 1865.

Dim, Frederick, Private, Co. C, 188th Pennsylvania. Drury's Bluff, June 14th, 1864. Fracture of lower jaw. New York and Phildelphia hospitals. Discharged May 4th, 1865.

Gorman, Michael, Corporal, Co. I, Second Veteran Reserve Corps. January 18th, 1865. Punctured wound under right eye. Elmira hospital. Duty February 11th, 1865.

Willard, Henry C., Corporal, Co. B, 13th New Hampshire. Petersburg, June 13th, 1864. Mustered out of service June 21st, 1865.

Corbett, Michael, Private, Co. C, 13th New Hampshire. Petersburg, June 25th, 1864. Mustered out of service December 19th, 1865.

Gaycorn, John, Private, Co. —, Vermont Volunteers. Lee's Mills. April 16th, 1862. Bayonet wound of face, accidentally. Returned to duty.

Roark, John, Private, Co. A, 30th Massachusetts. Baton Rouge, February, 1862. Discharged June 5th, 1863.

Merdeer, Millorn, Private, Co. B, 21st United States Colored Troops, aged 26 years. October 28th, 1865. Hilton Head hospital. Duty November 22d, 1865.

Barr, Joseph, Private, Co. C, 97th Pennsylvania. Deep Bottom, August 16th, 1864. Virginia and Philadelphia hospitals. Discharged June 20th, 1865.

Whittaker, Matthew, Private, Co. F, 32d Ohio. Bayonet wound. McDowell, May 8th, 1862.

Moran, Thomas, Private, Co. F, 13th Missouri. Bayonet wound of face. Fair Oaks, May 31st, 1862.

Sullivan, Daniel, Private, Co. I, 69th New York. November, 1864. Field hospital. Duty November 11th, 1864.

Gould, Charles G., Captain, Co. H, 5th Vermont, aged 18 years. Petersburg, April 2d, 1865. Field hospital. Mustered out of service June 19th, 1865.

White, Charles, Private, Co. E, 23d United States Colored Troops. Petersburg, July 30th, 1864. Field hospital. Duty September 17th, 1864.

Beldon, H., Corporal, Co. B, 41st Ohio. Murfreesboro', December, 1862. Field hospital.

Burnham, G. W., Lieutenant, Co. G, 6th Maine. Fredericksburg, May 3d, 1863. Washington hospital. Resigned March 20th, 1864.

Houston, Richard, Private, Co. C, 31st Illinois. Belmont, November 7th, 1861. Punctured wound under eye. Died April 22d, 1862.

Leonard, Solomon, Private, Co. G, 179th New York. Petersburg, June 30th, 1864. Field hospital. Duty August 9th, 1864.

Lang, Mason, Private, Co. G, 14th New York, aged 37 years. Petersburg, July 30th, 1864. Punctured wound of left eye; also gunshot wound of scalp. Field, Washington, and New York hospitals. Transferred to Veteran Reserve Corps, March 20th, 1865.

BEERSCHNIDER, JOHN, Private, Co. A, 4th New York Cavalry. Punctured wound, with loss of right eye. Georgetown hospital. Discharged February 2d, 1863.

SMITH, JOHN, Private, Co. H, 17th New York, aged 25 years. New York City, July, 1863. Punctured wound of the left eye. Desmarres Hospital, Washington. Simple dressings applied. Sight of eye greatly diminished. Frequent and protracted attacks of asthma. Condition of eye unimproved. Discharged February 26th, 1864.

BRADY, PETER S., Private, Co. K, 3d Kentucky. Chickamauga, September 20th, 1863. Nashville hospital. Duty September 26th, 1864.

HANK, DAVID, Private, Co. B, 17th Ohio Volunteers, Cumberland hospital, Nashville. Returned to duty January 18th, 1864.

SAGEE, ANDREW, Private, Co. D, 73d Pennsylvania, aged 49 years. Bird's Ferry, Virginia. Punctured wound, causing evacuation of humors of left eye. Rhode Island and Philadelphia hospitals. Returned to duty May 27th, 1864.

EDELE, F., Private, Co. E, 98th Pennsylvania Volunteers, aged 44 years. Maryland hospital. Returned to duty January 29th, 1864.

HENDERSON, RANDSOR, Private, Co. B, 4th Maryland Volunteers. Belle Island, February 22d, 1864. Washington, Maryland, and Pennsylvania hospitals. Discharged June 9th, 1865.

FOX, JOSEPH, Sergeant, Co. G, 148th Pennsylvania, aged 20 years. August 25th, 1864. Lincoln hospital. Duty September 24th, 1864.

Besides these sabre and bayonet wounds, there were incised, punctured, contused, and lacerated wounds of the face, from stabs, blows, kicks, railway accidents, and other causes, which may be summed up as follow:

TABLE IX.

Results of Sixty-four Cases of Fractures of the Bones of the Face from Various Causes.

REGION.	CASES.	DUTY.	DISCHARGED.	DIED.	UNKNOWN.
Upper Maxilla	11	4	4	1	2
Inferior Maxilla	39	25	8	1	5
Maxilla (not stated),	3	2	1	.....	.....
Nasal	10	5	4	1	.....
Malar	1	1	.....	.....	.....
Aggregates	64	37	17	3	7

There were also reported two hundred and seventy-one flesh wounds of the face from similar causes, as follow:

TABLE X.

Results of Two Hundred and Seventy-one Cases of Injuries of the Face from Miscellaneous Causes.

CHARACTER.	CASES.	DUTY.	DISCHARGED.	DIED.	UNKNOWN.
Lacerations	35	29	5	.....	1
Contusions	154	96	45	2	11
Punctured Wounds (not bayonet)	24	7	15	.....	2
Incised Wounds (not sabre),	34	27	5	1	1
Unspecified	24	8	13	.....	3
Aggregates	271	167	83	3	18

Section II.

GUNSHOT WOUNDS.

Gunshot wounds of the face, comprising those of the external ear, of the eyes, the nose, the cheeks and lips, the buccal cavity with the teeth and tongue, and the jaws, while causing, often, great disfigurements, have not a high ratio of mortality. Secondary hæmorrhage, or suppuration and necrosis following the lodgement of balls in the spongy bones of the nasal and supra-maxillary regions, are among the more common causes of fatality in gunshot wounds of the face. Wounds of the auricle presenting little importance, will be summed up in the tabular statement at the end of the chapter. They are more commonly associated with wounds of the neck than of the face. Gunshot injuries of other parts of the face will be considered according to region; but, as they are so frequently complex, precise classification is impracticable.

Gunshot Wounds of the Orbital Region.—These include the wounds of the eyelids, often accompanied by much loss of tissue or by blepharoptosis or ectropion; or of the eye-brows, frequently followed by amaurosis; of the globe of the eye or of both eyes, involving traumatic cataract, or staphyloma, or entire evacuation of the humors, and fractures of the bones composing the orbit. We will commence with the most serious cases, those in which both eyes were destroyed:

Case.—Private *William V———*, Co. E, 1st Texas Regiment, was wounded at the battle of Arkansas Post, January 11th, 1863, by a fragment of shell. The missile entered the right side of the face, destroyed both eyes and fractured the left wing of the sphenoid and the petrous portion of the left temporal. He was left on the field until cared for by the Union surgeons. After a light dressing had been placed over the shocking laceration, and anodynes had been administered, he was conveyed to the hospital transport steamer D. A. January, and conveyed to St. Louis and placed in the City Hospital. On admission it was found that the nasal, lachrymal, body of the ethmoid, the turbinated bones, the vomer, and the upper parts of both superior maxillaries had been carried away. Both malar bones were separated and dislocated backward. The soft parts of the face were erysipelatous or sloughing. Inflammation had extended to the brain. He survived this terrible injury thirteen days, death coming to his relief on January 23d, 1863, the day after he entered the hospital at St. Louis. The patient was under the care of Surgeon John T. Hodgen, U. S. V., who forwarded the specimen, which is represented in the wood-cut (Fig. 155), with a memorandum of the case, to the Army Medical Museum. A fracture traverses the body of the sphenoid and petrous portion of the left temporal bone, and a second fissure divides, longitudinally, the palatine process of the right superior maxillary. The frontal sinuses, which are very large, are freely exposed, and the cranial cavity is opened through the ethmoid, the opening measuring three-fourths by one-half inch.

Fig. 155.—Destruction of the eyes and orbital region. *Spec.* 1016, Sect. I, A. M. M.

Case.—Sergeant Jefferson Coates, Co. H, 7th Wisconsin Volunteers, aged 20 years, was wounded at Gettysburg, July 2d, 1863, by a conoidal ball, which entered immediately behind the outer angle of the right eye, passed through the orbital plate at the junction of the malar and frontal bones, through the great wing of the sphenoid, and emerged at a point corresponding to the place of entrance, producing a wound not less than an inch and a half in diameter, and tearing away nearly the whole of the orbital plate. The wound of entrance was about half an inch in diameter. He was admitted to the Seminary Hospital, Gettysburg, and, on July 8th, transferred to the Satterlee Hospital, Philadelphia. When admitted, the tunics of the right eye were hanging out and much tumefied, about as large as a black walnut, and covered with a mass of slough; there was complete eversion of the right lower lid; otherwise the lids of both eyes were uninjured. The left eye was shrunken, its contents evacuated, and the upper lid was overlapped by the lower. In other respects, with the exception of a slight inflammation, the tunics of this eye were healthy in appearance. In its passage, the ball had apparently passed immediately beneath the cribriform plate of the ethmoid, destroying a portion of the latter and the lachrymal bones, and probably severing the optic nerves. There was a profuse discharge of pus from both wounds, and a little through the laceration in the tissues of the left eye. The sense of smell was entirely destroyed. The patient was in a tolerably good condition, but restless; his appetite was moderate, tongue slightly furred, and pulse about 90. Flaxseed dressings were applied. On July 10th, what appeared to be the external angular process of the frontal bone was taken from the left wound; also several small spiculæ from the right side. On the 11th, the wounds looked better; on the 13th, a small bone, probably from the orbital portion of the great wing of the sphenoid, left side, was extracted. On the 17th, the slough separated entirely from the right eye, which presented a much improved condition. No symptoms of cerebral disturbance had appeared. On the 19th, there was considerable œdema of the left eye, and the inflammation was more marked. On July 21st, a thin plate of bone was discharged from the nose, apparently a piece of the perpendicular plate of the ethmoid. Œdema of the upper lip had much increased, though with very little pain. July 24th: the œdema of the left eye was rapidly disappearing under a watery discharge, which tasted salty. July 25th: another small piece of bone came away from the left wound. There was still a profuse discharge; the right wound was much smaller, and the left was granulating finely. Night sweats occurring, quinine in solution with aromatic sulphuric acid was given every three hours. The right eye was less congested, and the protruding portion was rapidly disappearing under the action of sulphate of copper in crystal. The patient was in good spirits. August 1st: the discharge from the left eye was but small, and healthy granulations were springing up; the discharge from the nose and the night sweats had ceased. August 8th: the wound of entrance had healed; that of exit was rapidly closing. The patient was discharged on September 22d, 1864, and pensioned. Acting Assistant Surgeon M. J. Grier, who reports the case, states that after the insertion of the artificial eyes there will be very little deformity.

Case.—Private William Brown, Co. D, 119th Pennsylvania Volunteers, aged 24 years, was wounded at Cold Harbor, Virginia, June, 1864, by a conoidal ball, which entered the right temple two inches from the orbit, and emerged through the right eyeball. He was admitted to hospital 1st division, Sixth Corps; on June 11th, transferred to Campbell Hospital, Washington, and on July 23d, sent to Satterlee Hospital, whence he was discharged June 28th, 1865. The right eye was totally destroyed, and the sight of the left eye was lost. In March, 1868, he was a pensioner at $25 per month, his disability being rated total and permanent. Dr. J. A. McArthur reports that Brown was under his care at Soldiers' Home, Philadelphia, until January 27th, 1869, when he died of phthisis pulmonalis. At the time of his death, he suffered from total blindness.

Case.—Private *Charles C———*, Co. H, 30th North Carolina Regiment, aged 30 years, received, at the battle of the Wilderness, May 7, 1864, a gunshot wound of the face. The missile entered the left temple, passing obliquely anteriorly, and emerging one inch below the left eye, severely fracturing and comminuting the superior maxilla, and completely destroying the nasal bones. He was among the captured wounded sent on hospital transports to Washington, and on May 14th was admitted to Carver Hospital. He was very low, and in a comatose state, requiring considerable exertion to arouse him sufficiently to partake of food and stimulants, which were freely administered. He took a quart of milk punch daily. Detergent lotions were applied to the wound. The contents of the left orbit were evacuated, and the vision was destroyed in the right eye. Inflammation gradually extended to the brain; but without any very violent symptoms. The patient survived twenty days, death resulting May 27th, 1864. Acting Assistant Surgeon J. E. Winants reported the case and sent the specimen, figured in the wood-cut (Fig. 156), to the Army Medical Museum. The right malar, the bodies of both superior maxillaries, both lachrymal bones, the body of the ethmoid, with the turbinated bones, the left great ala of the sphenoid, and the left external angular process of the frontal with the orbital plate have been carried away. The left parietal is fissured from the anterior inferior angle to the parietal eminence. The left palate bone is fractured across, the sphenoid cells are exposed, and the cranial cavity is freely opened. The edges of the fractured bones are slightly necrosed and show traces of an attempt at repair.

Fig. 156.—Cranium showing a gunshot fracture of the orbital region. *Spec.* 2899, Sect. I, A. M. M.

Cameron, Joseph, Sergeant, Co. A, 13th Ohio Cavalry, aged 25 years. Gunshot fracture of facial bones. Conoidal ball entered one-half inch below external canthus of right eye, passed under the nose, and emerged at the outer angle of left eye, carrying away a considerable portion of orbital plate. Petersburg, Virginia, July 30th, 1864. Complete loss of sight in both eyes. Discharged January 2d, 1865, and pensioned.

CASE.—Private John T. Cole, Co. A, 10th Vermont Volunteers, aged 24 years, was wounded at Petersburg, April 2d, 1865, by a conoidal ball, which entered just above the left zygoma, passed through the orbit, and emerged through the outer and upper portion of the right orbital structure, destroying both eyes. He was, on the following day, admitted to the depot field hospital at City Point; on April 7th, sent to the Lincoln Hospital, Washington, and, on May 26th, transferred to the Sloan Hospital, Montpelier, Vermont. At this time the wound of entrance had healed and the general health of the patient was good, but lying on the left side would cause headache; the sense of smell was entirely destroyed. Cold water dressings were applied; during the treatment, small pieces of bone were taken from the wound of entrance. Otherwise the case progressed well, and, on June 12th, 1865, Cole was discharged from service and pensioned at $25 per month

CASE.—Private William H. Davis, Co. C, 51st Ohio Volunteers, aged 22 years, was wounded near Kenesaw Mountain, Georgia, June 20th, 1864, by a conoidal ball, which entered the inner canthus of the right eye, passed through the base of the nose and left eye and emerged at the left temple, destroying both eyes. He was admitted to the hospital of the 2d brigade, 3d division, Fourth Corps; on June 25th, sent to field hospital at Chattanooga, Tennessee; on July 11th, to Hospital No. 8, Nashville; on July 22d, to Totten Hospital, Louisville, Kentucky, and on August 3d, to Camp Chase, Ohio, where he was discharged from the service October 27th, 1864, and pensioned.

CASE.—Sergeant Philip Gottman, Co. E, 74th New York Volunteers, received, at the battle of Gettysburg, July 2d, 1863, a gunshot wound of the left temple, the missile destroying in its course both eyes. He also received, in the same engagement, two wounds of the left thigh and one of the right. He was admitted to the Field Hospital, and on July 8th, sent to the Jarvis Hospital, where he was discharged the service December 15th, 1863. The wounds had all healed, but the patient was totally blind. He was, in March, 1868, a pensioner at $25 per month.

CASE.—Private H. C. Green, Co. F, 2d New York Cavalry, was, on January 28th, 1864, admitted to regimental hospital, with a gunshot fracture of the temporal bone. A conoidal ball entered upon the right side of the head, about one and a half inches from the angle of the right eye, and emerged near the outer angle of the left eye. He was, on June 29th, left in the hands of the enemy, but was afterward exchanged, and on October 5th, 1864, discharged from the service. Examiner Cyrus Porter, M. D., reports, October 5th, 1864, that he is entirely blind.

CASE.—Private John Miller, Co. I, 7th New York Heavy Artillery, aged 42 years, was wounded at Hatcher's Run, April 2d, 1865, by a conoidal ball, which entered the anterior part of the right temporal region, traversed both orbits, and emerged at a corresponding point on the opposite side of the head. He was sent to the hospital at Fort Monroe on April 13th, and on July 15th, was transferred to the Ira Harris Hospital, Albany, and discharged November 30th, 1865, and pensioned. He was totally blind, and the orbits were filled with profuse granulations of a flabby, spongy character. There was slight ectropion of both eyelids, the lashes resting against the contents of the sockets of the eyes, giving rise to considerable irritation. *Vide* Card Photographs, Vol. VI, page 9.

CASE.—Private Elisha R——, Co. F, 67th, Indiana Volunteers, received, at the battle of Carrion Crow Bayou, Louisiana, November 3d, 1863, a gunshot compound comminuted fracture of the facial bones. The missile entered posterior to the right external angular process of the frontal bone, passed forward and inward, destroying the right eye, and carried away the nasal and lachrymal and the orbital processes of the superior maxilla, and emerged through the internal canthus of the left eye. He was, on November 9th, admitted to the University Hospital, New Orleans. Simple dressings were applied to the wound. The patient died November 22d, 1863. The *post mortem* examination showed an abscess in the right anterior lobe of the cerebrum. The lesions about the orbit are represented in the adjacent wood-cut (FIG. 157). The orbital portions of the right malar and upper maxilla are wanting, and the greater part of the turbinated bones are comminuted and removed. The frontal sinuses and sphenoidal cells are freely opened. The specimen and notes of the case were contributed by Assistant Surgeon P. S. Conner, U. S. A.

FIG. 157.—Gunshot fracture of the right orbital region. *Spec.* 2989, Sect. I, A. M. M.

CASE.—Private Daniel Stansbury, Co. I, 3d Maryland Volunteers, aged 36 years, was wounded near Petersburg, Virginia, June 17th, 1864, by a conoidal ball, which injured the skull and destroyed both eyes. He was admitted to field hospital, Ninth Corps; on June 25th, sent to DeCamp Hospital, New York Harbor, and, on August 11th, transferred to Newton University Hospital, Baltimore. He was discharged from the service on May 16th, 1865, and pensioned.

CASE.—Private John W. Williams, Co. F, 16th United States Infantry, was wounded at Chickamauga, Georgia, September 20th, 1863, by a fragment of shell, which caused a wound of the right side of scalp, destroyed the right eye, and grazed the orbital ridge. He was admitted to the 1st division hospital at Annapolis, and discharged from service December 21st, 1863, and pensioned. Examiner H. Lenox Hodge, M. D., reports, February 15th, 1864, that the humors of the right eye have been evacuated and that the left eye was probably torn from its proper position by the blow. The pensioner suffers from total blindness.

CASE.—Private Henry Zimmerman, Co. I, 42d New York Volunteers, was wounded at Antietam, September 17th, 1862, the missile having passed through the head from temple to temple. He was conveyed to the hospital of the Second Corps at the Hoffman House, and on October 1st, was admitted to Camp A Hospital, Frederick. Total loss of vision resulted, and the patient was discharged the service on December 19th, 1862, and pensioned. Subsequent information avers that the patient's lower jaw was anchylosed. His disability is rated total and permanent.

CASE.—Sergeant William H. Ferdon, Co. A, 40th New York Volunteers, aged 25 years, was wounded in the engagement at Hatcher's Run, Virginia, March 25th, 1865, by a conoidal ball, which entered the right temporal region near outer angle of right eye, and passing through the orbital portion of the sphenoid bones on both sides, severed in its course the optic nerves of both

eyes. The point of exit was directly opposite the point of entrance. He was, on the following day, admitted to the depot field hospital of the Second Corps, at City Point, and on March 29th, transferred to the Armory Square Hospital, complaining of much pain in the head. He could not tolerate opium or morphine. Nervines were given every hour, till quiet was procured, and good wine, in small quantities, allowed. On April 26th, the wound was nearly healed, but the patient was entirely blind. On May 15th, 1865, he was transferred to New York, where he was discharged June 13th, 1865, and pensioned.

Case.—Private Marion F. Johnston, Co. F, 116th New York Volunteers, aged 20 years, was wounded at Winchester, Virginia, September 19th, 1864, by a musket ball, which struck the left orbital ridge, and emerged just above the malar process of the right superior maxillary bone, destroying both eyeballs. He was admitted to the depot field hospital, and thence transferred, on October 11th, to Hospital No. 1, at Frederick. He had almost lost his sight, but did not present any cerebral symptoms, and the wounds of entrance and exit discharged laudable pus. Several spiculæ of bone were removed from the wound of exit. On October 14th epistaxis, amounting to two ounces, took place, and the conjunctivitis partially subsided, but the vision was not yet restored. The patient made now a rapid recovery, and was furloughed on the 1st of November, 1864. At the expiration of his leave, he was, on January 3d, 1865, admitted into the hospital at Buffalo, New York, and discharged from service on April 3, 1865. He has been pensioned at the rate of twenty-five dollars per month, his disability being rated total and permanent. The case is reported by Acting Assistant Surgeon R. W. Mansfield.

Biggs, Jacob, Private, Co. F, 81st Indiana Volunteers, aged 23 years. Gunshot wound of face; loss of both eyes. Marietta, Georgia, June, 1864. Admitted to Hospital No. 14, Nashville, Tennessee, July 8th, 1864. Sent to hospital at New Albany, Indiana, July 25th, 1864. Discharged May 2d, 1865, and pensioned.

Barrett, Sylvester, Private, Co. E, 2d Connecticut Artillery, aged 19 years. Cold Harbor, June 1st, 1864. Destruction of both orbits by conoidal ball. Alexandria hospital. Died July 22d, 1864.

Benjamin, John P., Corporal, Co. H, 170th New York Volunteers, aged 19 years. North Anna River, May 27th, 1864. Fracture of temporal, with injury to both eyes. Field, Washington, and New York hospitals. Died October 4th, 1864.

Collins, Edwin F., Private, Co. F, 6th Connecticut Volunteers. Near Richmond, October 7th, 1864. Loss of both eyes. Field hospitals. Died October 16th, 1864.

Davenport, C. C., Private, Co. H, 2d Louisiana Regiment. Gunshot wound, destroying both eyes. Chancellorsville, Virginia, May 3d, 1863. Admitted to Louisiana Hospital, Richmond, Virginia. Furloughed, for sixty days, June 13th, 1863.

Griselle, Balthasar, Private, Co. E, 44th Illinois Volunteers. Gunshot wound of forehead, with loss of both eyes. Franklin, Tennessee, December 17th, 1864. Admitted to Hospital No. 3, Nashville, Tennessee. Died January 6th, 1865.

Garran, J. L., Private, Co. K, 17th South Carolina Regiment. Gunshot wound of face, destroying both eyes. Admitted to hospital at Petersburg, Virginia, November 10th, 1864. Died November 12th, 1864.

Haase, Henry, Sergeant, Co. H, 29th Alabama Regiment, aged 25 years. Nashville, December 15th, 1864. Fracture of frontal, with destruction of eyes. Field and Nashville hospitals. Died December 18th, 1864.

Henson, Jonathan, Private, Co. G, 6th United States Colored Troops. New Market, September 19th, 1864. Fracture of frontal, malar, and nasal bones, resulting in the loss of both eyes; also perforating wound of abdomen. Portsmouth hospital. Died October 1st, 1864.

Hendrickson, William C., Sergeant, Co. F, 3d Kentucky Volunteers. Gunshot wound of face. Ball entered half an inch below outer angle of right eye, and emerged at outer angle of left eye, destroying both eyes and impairing sense of smell. Chickamauga, Tennessee, September 20th, 1863. Discharged December 5th, 1863, and pensioned.

Hodgdon, John M., Sergeant Major, 13th New Hampshire Volunteers. Gunshot wound of face, ball destroying the sight and fracturing the lower jaw. Discharged June 14th, 1865, and pensioned.

Kooken, Jefferson, Private, Co. I, 123d Ohio Volunteers, aged 44 years. Missile entered at external angle of left eye and emerged at external angle of right eye, producing blindness. Discharged May 26th, 1865, and pensioned.

Merritt, J. J., Private, Co. C, 24th Georgia Regiment, aged 30 years. Gunshot wound of face; ball passing through and destroying both eyes. Gettysburg, July 2d, 1863. Paroled September 5th, 1863.

Mudge, William R., Private, Co. H, 2d Massachusetts Volunteers. Gunshot wound of face. Both eyes lost. Chancellorsville, Virginia, May 3d, 1863. Discharged and pensioned.

McDaniels, John, Co. C, 2d North Carolina Regiment, aged 25 years. Gunshot wound of face. Missile passed through both orbits, from side to side, destroying both eyeballs. South Mountain, Maryland, September 14th, 1862. Eyesight entirely lost. Sent to Fort McHenry, probably for exchange.

Ruoher, James, Private, Co. A, 2d United States Cavalry, aged 20 years. Winchester, September 19th, 1864. Fracture of parietal and frontal bones; both eyes destroyed. Field and Baltimore hospitals. Died December 6th, 1864.

Roose, Simon J., Private, Co. F, 145th Pennsylvania Volunteers, aged 28 years. Gunshot wound of face. Missile entered outer canthus of right eye, passed under the nasal bones, and emerged at the external canthus of left eye, completely destroying both eyes. Gettysburg, Pennsylvania, July 2d, 1863. Mental aberration supervened, but in September his condition gradually improved. Discharged October 28th, 1863. Not a pensioner.

Shoemaker, Thomas W., Private, Co. K, 40th New York Volunteers, aged 21 years. Conoidal ball entered at external angle of right eye, passed through the nose and lodged, destroying the right eyeball entirely. Inflammation and loss of sight of left eye. Discharged February 18th, 1865, and pensioned.

SHELON, JOHN M., Private, Co. A, 110th Pennsylvania Volunteers, aged 30 years. Gunshot wound of face. Conoidal ball entered external canthus of left eye, and emerged at outer angle of right eye, destroying both. Artificial eyes inserted. Discharged January 24th, 1865, and pensioned.

SANDERSON, GEORGE W., Private, Co. G, 186th New York Volunteers, aged 36 years. Shell wound of superior maxillla. Petersburg, Virginia, April 2d, 1865. Discharged June 5th, 1865. Both eyes involved; total blindness. He is a pensioner.

UNGERER, JACOB, Private, Co. B, 15th New York Artillery, aged 31 years. Gunshot wound of face; missile destroying both eyes. Petersburg, June 19th, 1864. Discharged April 25th, 1865. Not a pensioner.

WINTRESS, DAVID H., Private, Co. C, 139th New York Volunteers. Gunshot wound of face. Conoidal ball entered left cheek one inch below the eye, passed through and emerged near the temporal bone, destroying in its course both eyes. Discharged July 28th, 1863. It is stated that sixty-five pieces of bone were removed from the wound. He is a pensioner.

YENGLING, JOHN, Private, Co. C, 24th Indiana Volunteers, aged 35 years. Fracture of right nasal bone and orbital process of same side; both eyes destroyed. Champion Hills, Mississippi, May 16th, 1863. Discharged July 7th, 1863. Not a pensioner.

Of the foregoing thirty-nine cases of destruction of both eyes by gunshot injury, eleven were fatal. Twenty-two of the survivors were pensioned. Several of the fatal cases were complicated by other serious wounds.

The next category comprises cases in which only one eye was destroyed.

CASE.—Private Peter Bice, Co. B, 57th New York Volunteers, aged 30 years, was wounded at Gettysburg, July 2d, 1863, by a conoidal musket ball, which entered at the upper margin of the zygoma of the right side, passed through the apex of the right orbit, and emerged at about the centre of the lower margin of the left orbit. He was admitted to the regimental hospital on the same day, and thence conveyed to the Turner's Lane Hospital, at Philadelphia, on July 11th. Ordinary dressings were applied to the wound, and cathartics, stimulants, and tonics administered. By July 30th, the wound had healed, and the patient complained only of stiffness of the jaw. The vision of the left eye was good, while that of the right was entirely destroyed. On November 3d, 1863, he was transferred to the Veteran Reserve Corps. The case is reported by Assistant Surgeon C. H. Alden, U. S. A. Pension Examiner Lathrop, M. D., reports, December 19th, 1866, that the lens of the right eye is opaque, and that the lachrymal duct of the left eye is obliterated, and the visual power much impaired.

CASE.—Sergeant George Prince, Co. I, 3d New Jersey Cavalry, aged 28 years, was wounded at Winchester, September 19th, 1864, by a conoidal ball, which fractured the bones of the face. The missile entered just below the zygomatic process, on the right side, passed through, carrying away the inferior and superior turbinated bones, emerged about one inch below the left eye, and destroyed the right eye. He was conveyed to the field hospital, cavalry corps; transferred to Baltimore, October 28th, and on the following day was admitted into the Newton University Hospital. On November 28th, he was transferred to Haddington Hospital, Philadelphia. Anodyne dressings were applied to the wound, and spiculæ of bone removed from time to time. On May 11th, 1865, he was admitted into the Satterlee Hospital, and on July 22d transferred to Ward Hospital, Newark, New Jersey, whence he was discharged the service August 30th, 1865. A. M. M., Surgical Photographic Series No. 312. He was pensioned and was, for a long time, a messenger of the Treasury Department at Washington. His general health was good in June, 1871, when he came to the Surgeon General's Office for examination. There were frequent exfoliations from the ethmoid and turbinated bones, and a constant suppuration from a cloaca in the site of the left lacrymal sac.

CASE.—Private William Bittinger, Co. G, 12th Pennsylvania Volunteers, was wounded before Richmond, June 28th, 1862, by a conoidal ball, which destroyed the left eye, and passing obliquely outward, fractured the orbit, and emerged at a point two inches above and behind the left eye. He was conveyed to Baltimore July 25th, and placed in McKim's Mansion; transferred on September 19th to West's Buildings, and on April 29th, 1863, to the York Hospital in Pennsylvania. On October 21st, he was returned to Baltimore, and admitted into the Patterson Park Hospital, and in July, 1864, transferred to Harrisburgh, to be mustered out of service. Pension Examiner Rahter, M. D., reports, April 23, 1869, that the bones of the left orbit are all broken away, leaving great deformity. What remains of the eyelid is everted, exposing the sensitive conjunctiva.

CASE.—Private Thomas Breen, Battery L, 1st Illinois Artillery, aged 29 years, was wounded near Cumberland, Maryland, on August 1st, 1864, by a conoidal musket ball, which entered at the inner canthus of the right eye, passed downward and backward, through the bones of the face, and lodged in the fauces, whence it was ejected in coughing. He was admitted to the hospital at Cumberland, much depressed from the shock, as well as from the loss of blood. Upon examination of the wound, it was found that the missile had carried away a portion of the inner wall of the orbit, the superior maxillary, the nasal bones, and the vomer. The eye seemed to have escaped injury. The detached fragments of bone were removed, cold-water dressings applied, and expectant treatment was used. On the following day, there was a sanious discharge from the wound, some of which passing into the stomach, induced more or less vomiting. The tumefaction increased until suppuration was established, on the 6th, when there was marked subsidence of the febrile symptoms. The right eye was disorganized. The patient was discharged February 20th, 1865, his wound having healed. In July, 1868, the pension examiner reports him in good health, with the loss of his eye as his disability.

CASE.—Private William H. Nims, Co. D, 61st New York Volunteers, was wounded June 17th, 1864, in front of Petersburg, and was admitted into the hospital of the 1st division, Second Corps, and thence sent to Columbian College Hospital, at Washington, June 22d, 1864. He was struck by a fragment of shell, which evacuated the humors of the right eye, and fractured the nasal bones and right superior maxilla. The treatment consisted in the removal of fragments of bone, and adjust-

ment of the lacerated soft parts. On April 25th, 1865, there was a small fistula, communicating, probably, with a necrosed fragment of the spongy bones. Surgeon Thomas R. Crosby, U. S. V., who had directed the patient's treatment, had removed all accessible dead bone, had continued to keep the nasal canal pervious, and so coaptated the lacerated parts about the orbits as to secure a cicatrix, showing as little deformity as the gravity of the injury would permit one to hope for. A photograph of the patient was made at the Army Medical Museum (Vol. 1, p. 32, *Surg. Series*). The patient was discharged from service and pensioned April 26th, 1865. In 1867, Pension Examiner G. W. Avery, reported that this pensioner continued to suffer greatly, and that the very unpleasant deformity induced by his wound, made it impracticable for him to obtain employment. Thus his mutilation was a doubly cruel one.

Case.—Private Jonas Erray, Co. H, 10th New York Cavalry, aged 23 years, was wounded near Shepherdstown, July 16th, 1863, by a conoidal musket ball, which entered the frontal bone one inch above the right superciliary ridge, near the median line, passed downward and outward, and lodged in the superior maxillary bone. Insensibility, of four or five hours duration, followed the injury. The patient remained at the field hospital until the 30th, and was then conveyed to Hospital No. 1, at Frederick. The wound had nearly cicatrized, but the pulsations of the brain were plainly visible; the sight of the right eye was destroyed, and sensibility on that side of the face was lost. On the 2d of August, pain in the head supervened, due, in a measure, to the irritation produced by the injured eye, with which, moreover, the sound eye sympathized. The pain continuing unabated, Acting Assistant Surgeon John H. Bartholf extirpated, on August 11th, the right organ of vision. The headache still continued until the 20th, and giddiness was produced by the least exertion; the power of feeling and of smell in the right nostril had, by this time, somewhat improved. On the 28th of the month, the socket of the right eye was granulating healthily, and there was only little discharge from the original wound. On October 1st, the wound had so far healed that the pulsations of the brain ceased to be visible. On November 3d, the missile was detected behind the last molar tooth and extracted by the dressing forceps. The sensibility of the fifth pair of nerves was now restored but the mobility of the jaw remained limited. The patient was discharged from service on November 16th, 1863. The pathological specimen, No. 3970, Sect. I, A. M. M., exhibits the cornea and lens of the right eye. The vitreous humor in great part remains opaque and of a yellowish white color. A collection of clotted blood fills the anterior portion of the cavity, protruding through the iris. The case is reported by the operator, Acting Assistant Surgeon John H. Bartholf. Pension Examiner J. K. Stanchfield, M. D., reports, December 21st, 1863, that the opening in the forehead is not yet closed and sometimes discharges.

Case.—Colonel Patrick R. Guiney, 9th Massachusetts Volunteers, was wounded at the battle of the Wilderness, May 5th, 1864, by a conoidal musket ball, which entered just above the inner angle of the left eye and passed across the orbit and behind the malar bone and zygoma to near the ear, where it lodged. The missile fissured the frontal bone at the inner extremity of the supra-orbital ridge quite deeply, and must have penetrated the frontal sinus. The eye was destroyed, and, in removing the ball, Steno's duct was severed. He was admitted to the hospital of the 1st division, Fifth Corps, and, on May 12th, sent to Washington, where he received a leave of absence on May 14th, 1864. He was mustered out of service on June 21st, 1864, and pensioned. For a year after the reception of the injury a salivary fistula continued to discharge, when one day the discharge ceased suddenly with a sensation of an electric thrill. No discharge recurred, but the thrill is renewed whenever, in shaving, the razor touches the cicatrix. Although the wound was not immediately connected with the brain it has affected it in its functions. He is unable to concentrate his thoughts for any length of time without suffering from dizziness and confusion of ideas, the dizziness becoming so decided at times, as to necessitate the grasping of objects near him for support. Since the war, while serving as Assistant District Attorney at Boston, he has been obliged to bathe his head, during the session of the court, to enable him to attend to his duty. He is now, February 1st, 1870, wholly unfitted to attend to his duties by reason of pneumo-hydrothorax. The case is reported by Dr. P. A. O'Connell, late Surgeon 9th Massachusetts Volunteers.

Case.—Private John F. Lord, Co. I, 1st Maine Cavalry, aged 24 years, was wounded at the battle of the Wilderness, May 6th, 1864, by a conoidal musket ball, which entered the left eye and lodged at the left temple. He was at once admitted to the hospital of the 2d division, Cavalry Corps, thence conveyed to Washington, and admitted, on the 11th, into the Emory Hospital, where the missile was extracted and the wound dressed in the usual manner. On May 16th, he was transferred to the De Camp Hospital, New York, and thence, on June 2d, sent to the Cony Hospital at Augusta, Maine. On February 16th, 1865, he was discharged from service and pensioned. Examiner John L. Allen, M. D., reports, October 22d, 1866, that there is a depression of the skull over the left eye, resulting in paralysis of left side and upper and lower extremities. He can but just drag himself about.

Case.—Private *Jack Kemp*, Texas Partisan Rangers, aged 35 years, was wounded at La Fourche Crossings, Louisiana, June 21st, 1863, by a conoidal ball passing from right to left obliquely and backward, carrying away the nose from root to the end of the osseous portion, just missing the right eye and destroying the left. The ball emerged near the outer angle of the left orbit. Portions of brain tissue escaped. Cold water dressings were applied, and opiates and stimulants given. Six weeks after the reception of the injury he was returned to the hands of the Confederates. He had been able to walk about the ward for two weeks; the wound was doing well, giving promise of entire recovery. The case is reported by Surgeon W. N. Trowbridge, 23d Connecticut Volunteers.

Case.—Private George Guptill, Co. K, 29th Maine Volunteers, aged 24 years, was wounded at the battle of Cedar Creek, October 19th, 1864, by a ball which passed through the upper lid of the left eye, penetrated the orbital plate and lodged, evacuating the humors of the globe. He was sent, on October 23d, to Satterlee Hospital, Philadelphia. Strict attention was paid to his diet, and his room was darkened. Several loose pieces of bone were removed. No attempt was made to find the ball. The patient's pulse was decidedly cerebral, slow and irregular. Erysipelas supervened. In the beginning of November, he complained of pain and twitchings of the muscles of the feet and occasional headache. Toward the end of November, he began to improve, and was discharged from the service on January 7th, 1865. The wound, which had been kept open as long as discharge issued, had closed, and he was, to all appearances, well. In July, 1868, the pension commissioner stated that Guptill was a pensioner at $8 per month, his disability being rated total and permanent. The case is reported by Surgeon I. I. Hayes, U. S. V.

Case.—Private James Neilson, Co. H, 118th Pennsylvania Volunteers, aged 28 years, was wounded in an engagement at Shepherdstown Ford, Maryland, September 20th, 1862, by a conoidal musket ball, which entered the mastoid process of the right temporal bone, and emerged at the external canthus of the left eye, destroying the organ, and tearing the lower lid so that it hung down over the face, even with the tip of the nose. He lay on the field in an insensible condition from morning until night, when he was taken to the Fifth Corps hospital. Thence he was transferred, on the 27th, to the Broad and Cherry Streets Hospital, Philadelphia, and on October 3d, to the Cuyler Hospital, at Germantown. When the inflammation had subsided, Acting Assistant Surgeon, J. M. Leedom, stitched the lower eyelid with lead suture. It soon united, and relieved the deformity very much. The patient being subject to fainting fits, almost epileptic in their character, bromide of potassium was administered, and after a few weeks the fits ceased to occur. He was transferred to the Veteran Reserve Corps on May 12th, 1864. In November, 1867, Neilson was able to follow his usual vocation of carpet weaving. There was a sero-purulent discharge from the eye, especially in damp weather, and he was still subject to fainting spells, when under any undue emotion, or when exposed to great heat. The reporter, Dr. Leedom, tried to introduce an artificial eye, but whenever it was inserted, a fainting spell was brought on.

Case.—Corporal John H. Seldon, Co. H, 21st Connecticut Volunteers, aged 24 years, was wounded at Petersburg, July 30th, 1864, by a conoidal musket ball, which entered the left temporal region, passed through the left orbit, and emerged through the right nostril. The left eye was entirely destroyed. He was taken to the hospital of the 1st division, Eighteenth Corps, and thence conveyed to Washington, and placed in the Campbell Hospital. On August 28th, he was sent to the Ladies' Home, New York, where he remained under treatment until November 30th, when he was transferred to the Knight Hospital, at New Haven. He was discharged from service February 10th, 1865. In 1869 he was a pensioner, his disability being rated as total. Mastication was difficult, his sense of smell was affected, and, beside the loss of his left eye, vision in the right eye was impaired. His mind had become so affected as to unfit him for mental application, and he complained of a dull pain in the head.

Fig. 158.—Round musket ball, with bits of facial bones impacted. *Spec.* 4408, Sect. I, A. M. M.

Case.—Private Thomas Thatcher, Co. K, 12th Ohio Volunteers, was wounded at Bull Run Bridge, August 27th, 1862, by a round musket ball, which entered the inner angle of the right eye, destroying that organ, passed obliquely downward and lodged at the angle of the left inferior maxilla. He was admitted to the Mansion House Hospital, Alexandria, where the ball was removed. The patient recovered and was discharged December 24th, 1862. The specimen and history of the case were contributed to the Army Medical Museum by Surgeon J. E. Summers, U. S. A. The ball, figured in the wood-cut (Fig. 158), is roughened and jagged, and there are bony particles embedded in the furrows. No application from this soldier appears upon the Pension Records, hence it may be hoped that his recovery was so complete that he did not require assistance.

Case.—Private George Thompson, Co. F, 6th Missouri Volunteers, was wounded at Arkansas Post, January 11th, 1863, by a pistol ball, which entered the inner portion of the right supra-orbital ridge, near the base of the nose, and passing outward and slightly downward, fractured the orbital plate, and lodged in the frontal sinus. He was conveyed by steamer to Memphis, and placed in Hospital No. 3, on January 23d. At the dressing of the wound, the course of the missile was traced along the fracture as far as the bottom of the orbit, beyond which it was not considered prudent to explore. The globe of the eye was disorganized and destroyed. For a considerable time inflammation ran very high, and the pain was exceedingly severe. The swelling, however, after two or three weeks, gradually subsided. The wound remained very painful afterward, and renewed treatment was necessary to allay the pain. Extirpation of the disorganized eye-ball was considered at this time, but the operation was rejected. Acting Assistant Surgeon Thomas F. Smiley, in his comments upon the case, declares his conviction that this should have been done, as thereby the missile, and probably splinters of bone at the bottom of the orbit as well, might have been removed. The patient was discharged from service on April 3d, 1863, though not entirely cured, yet still able to travel. In March, 1869, Examining Surgeon W. W. Potter reports this pensioner's disability as three-fourths and permanent.

Case.—Colonel James Washburn, 116th Ohio Volunteers, was wounded near Snicker's Ferry, July 18th, 1864, by a conoidal ball, which entered the corner of the left eye and emerged from below the right ear. The right side became paralyzed and the face grew distorted from contraction of the facial muscles. The left eye was entirely destroyed. He was mustered out on July 5th, 1865, and pensioned, his disability being rated total and permanent.

Case.—Private John A. Lasell, Co. C, 60th New York Volunteers, aged 24 years, received, at the battle of Gettysburg, July, 1863, a gunshot wound of the eye and head. He was conveyed to the field hospital, where he remained until July 10th, when he was transferred to New York, entering McDougall Hospital on the 12th. He died August 23d, 1864. Assistant Surgeon H. W. Sprague, U. S. A., reports the case.

Case.—Private *S. C. Kenningham*, Co. K, 12th Virginia Regiment, received, on July 15th, 1863, a gunshot wound of the eye. He was admitted to No. 1 Hospital at Richmond, soon after the reception of the injury, and died the day of his admission.

Case.—Private *M. W. Sexton*, Co. C, 13th South Carolina Regiment, received a gunshot wound of the left eye by a conoidal ball. He was admitted to the Jackson Hospital at Richmond, on July 29th, 1864, where he died on September 30th, 1864.

Case.—Private A. B. Wilson, Co. F, 10th Tennessee Volunteers, aged 29 years, while being taken, in a state of intoxication, to the guard-house at Fort Gillam, near Nashville, on September 20th, 1864, was accidentally wounded by a conoidal musket ball, at the angle of the nasal and malar bones, three-fourths of an inch below the inner canthus of the left eye, passed deeply beneath the nasal bones, upward, outward, and backward, and emerged at the junction of the frontal and the right parietal bones, two inches from the median line. He was immediately conveyed to Hospital No. 8, Nashville, in an unconscious state. The brain substance and bloody serum issued from the wound of exit, as well as entrance. The right eye was destroyed; its upper lid being nearly severed from its connections. The usual dressings were applied, and the treatment in the main was expectant.

During the day the pulse rose from 76 to 80, the respirations numbered 16, and consciousness was partially restored. On the 22d he had become fully conscious, and complained of pain in the head. The next morning the pulse was 96, and the respirations 20. He was still conscious, though mental effort was dull; but shortly afterward he sank into a state of coma. The brain substance now exuded freely. He died on September 24th, 1864. At the autopsy, on dividing the integuments between the wounds of entrance and exit, the nasal and frontal bones were found badly fractured, and several large fragments of the frontal were detached. Further examination disclosed extensive disorganization of the encephalon.

CASE.—Private Louis W——, Co. K, 10th Vermont Volunteers, aged 33 years, was wounded at the battle of Cold Harbor, Virginia, June 1st, 1864, by a conoidal musket ball, which entered the frontal bone above the nasal eminence, carried away both sinuses and a portion of the left orbital plate, destroyed the left eye, and escaped near the angle of the left ramus of the lower jaw. He was conveyed to Washington, and admitted, on the 9th, into the Lincoln Hospital. Death occurred June 16th, 1864. At the autopsy, an opening was found in the frontal sinus, measuring three-fourths by half an inch, through which a grayish slough, involving the brain, and exhaling a gangrenous odor, was observed. Upon the removal of the frontal portion of the calvarium to a level with the orbital region, a fragment of the wall of the sinus was found, adherent to the dura mater, beneath which membrane extravasation of venous blood existed. There was also a general enlargement of the veins of the cerebrum. The optic commissure and nerve were found lacerated, and the tuber cinereum in a sloughing condition. Some twelve ounces of venous blood exuded from the meningeal vein, especially from several points along the falx cerebri and falx cerebelli. The heart was fatty on the right side, but the lungs and other organs were perfectly sound. The pathological specimen is No. 2574, Sect. I, A. M. M., and was contributed, with its history, by Surgeon J. C. McKee, U. S. A.

ABBOTT, HARLIN, Private, Co. F, 77th New York Volunteers, aged 24 years. Spottsylvania, May 10th, 1864. Fracture of edge of left orbital arch and laceration of integuments of eyebrow. Left eye destroyed and sight of right eye impaired. Washington, Philadelphia, New York, and Albany hospitals; transferred to Veteran Reserve Corps. Discharged August 4th, 1865; pensioned.

ACKERLY, DARIUS, Corporal, Co. K, 19th Michigan Volunteers. Thompson's Station, Tennessee, March 5th, 1863. Bridge of the nose, right eye, and a portion of the temporal bone carried away by a conoidal ball; also wound of left thigh. Taken prisoner, exchanged, and treated at Annapolis and Camp Chase. Discharged October 23d, 1863.

ADAMS, ERASTUS, Private, Co. M, 1st Maine Heavy Artillery, aged 41 years. Petersburg, June 18th, 1864. Fracture of left side of frontal bone. City Point, Rhode Island, and Maine hospitals. Total loss of right and partial loss of left eye. Discharged July 14th, 1865, and pensioned.

AUSTIN, L., Private, Co. A, 24th New York Cavalry, aged 21 years. Petersburg, June 18th, 1864. Conoidal ball entered above the left eye and lodged under the right ear. Field, Washington, and Philadelphia hospitals. Left eye destroyed. Discharged June 14th, 1865, and pensioned.

ADAMS, GEORGE, Private, Co. I, 9th New Hampshire Volunteers. Petersburg, July 25th, 1864. Gunshot wound of face. Admitted to Emory Hospital, Washington, August 1st, 1864. Removal of spicula of bone. Discharged November 20th, 1864, with loss of right eye and partial loss of sight of left eye, and pensioned.

Adams, Thomas, Private, Co. K, 13th Arkansas Regiment, aged 24 years. Franklin, Tennessee, November 30th, 1864. Gunshot fracture of superior maxilla; eye destroyed. Sent to Provost Marshal for exchange June 9th, 1865.

AMOS, JOHN F., Private, Co. G, New York Volunteers, aged 24 years. Gravelly Run, Virginia, March 21st, 1865. Gunshot fracture of left nasal and superior maxillary bones. Entire destruction of left eye. Ligation of left common carotid artery. Discharged July 3d, 1865, and pensioned. A. M. M. Photograph Series, No. 283.

ABBOTT, JOEL, Private, Co. D, 12th New Jersey Volunteers. Chancellorsville, May 3d, 1863. Gunshot wound, fracturing orbital plate and destroying left eye. Sight of right eye sympathetically impaired. Washington, Delaware, and New Jersey hospitals. Discharged December 11th, 1863, and pensioned.

BOARDMAN, MORAND, Private, Co. B, 9th Illinois Volunteers, aged 41 years. Shiloh, April 6th, 1862. Fracture of malar and frontal bones and destruction of eye. City hospital, St. Louis. Great disfiguration. Discharged September 23d, 1862.

Bradley, J. C., Private, Co. G, 14th Alabama Regiment. Destruction of left eye and audition, left side, by gunshot missile. Treated in Richmond hospitals, and furloughed July 19th, 1864.

Britt, J. J., Sergeant, Co. D, 43d North Carolina Regiment, aged 27 years. Winchester, September 19th, 1864. Destruction of vision of left eye by a fragment of shell. Taken prisoner and treated in field and Baltimore hospitals. Sent to Provost Marshal for exchange April 8th, 1865.

BURKE, ALBERT J., Corporal, Co. I, 117th New York Volunteers, aged 28 years. Petersburg, July 9th, 1864. Destruction of right eye by explosion of shell. Fort Monroe, Rhode Island, and New York hospitals. Deafness of right ear. Discharged March 1st, 1865, and pensioned.

BURMEISTER, HENRY, Sergeant, Co. A, 9th Illinois Volunteers. Shiloh, April 6th, 1862. Fracture of right orbital arch and destruction of left eye. Quincy, Illinois, hospital. Exfoliation of bone. Repulsive deformity. Discharged September 22d, 1862, and pensioned.

Butler, W. C., Sergeant, Co. C, 15th Virginia Regiment. Gunshot wound through right orbit; also wound of thigh. Howard Grove Hospital, Richmond. Furloughed June 29th, 1864.

BYRNE, DUDLEY, Private, Co. A, 88th New York Volunteers. Antietam, September 17th, 1862. Loss of right eye. Philadelphia hospital. Discharged January 5th, 1863, and pensioned. There was great deformity, and the sense of smelling was gone. Neuralgic trouble also existed.

Barksdale, Hezekiah D., Private, Co. E, 6th Arkansas Regiment. Fracture of right orbital ridge; eye destroyed. Admitted to Confederate hospital, Dalton, Georgia. The result of the case is not recorded.

BALDERS, CHARLES, Corporal, Co. K, 134th New York Volunteers, aged 31 years. Gettysburg, July 1st, 1863. Fracture of frontal bone over left eye by conoidal ball; eye destroyed; also wound of right arm. Pennsylvania and New York hospitals. Discharged January 31st, 1865, and pensioned.

BELCHER, CHARLES, Private, Co. K, 6th Pennsylvania Volunteers. Antietam, September 17th, 1862. Fracture of frontal bone. Corps and Washington hospitals. Destruction of left eye and partial deafness of left ear. Discharged November 3d, 1862, and pensioned.

BIXBY, PHILIP, Private, Co. E, 92d New York Volunteers. Fair Oaks, May 31st, 1862. Fracture of frontal bone above left orbit; missile lodged, destroying sight. Field and New York hospitals. Discharged October 29th, 1862.

BRADDEN, ISAAC H., Private, Co. B, 24th Indiana Volunteers, aged 21 years. Champion Hills, Mississippi, May 16th, 1863. Gunshot wound; missile entered at the external canthus of left eye, passed under the bones, and emerged through the internal ear, fracturing orbital plate of malar bone, destroying eye, and causing entire deafness of ear. Memphis, St. Louis, and Madison hospitals. Discharged July 26th, 1864, and pensioned. Great deformity.

BROWN, JOHN, Private, Co. G, 2d Delaware Volunteers. Antietam, Maryland, September 17th, 1862. Gunshot wound of face. Conoidal ball entered right ear, and emerged from right eye, completely destroying the globe. Admitted to Satterlee Hospital, Philadelphia, October 29th. The lower lid became everted. Discharged January 20th, 1863, and pensioned.

Bennett, W. B., Co. B, 49th North Carolina Regiment. Gunshot injury of bones of face and destruction of right eye. Admitted to Chimborazo Hospital, Richmond, Virginia. Furloughed for sixty days.

Becket, J. Z., a Confederate soldier. Gunshot fracture of bones of face. Missile entered arch of nose and passed through right orbit, destroying the eye. Admitted to Howard Grove Hospital, Richmond, Virginia. Furloughed for sixty days, July 14th, 1864.

BONNELL, CHARLES, Private, Co. A, 64th Illinois Volunteers, aged 18 years. Gunshot injury of occipital and frontal bones, with destruction of right eye. Nashville, Tennessee, December 18th, 1864. Admitted to McDougall Hospital, New York, January 12th, 1865. Discharged June 26th, 1865, and pensioned.

BARNES, THOMAS G., Private, Co. H, 67th New York Volunteers, aged 21 years. Conoidal ball entered frontal bone to left of median line, traversed the sinus, and lodged in nasal foramen; also wound of left thigh, two inches above knee. Admitted to Post Office Hospital, Washington, December 11th, 1862; sent to Ladies' Home Hospital, New York, January, 1863. Aqueous humor of left eye ran out. Discharged May 18th, 1863. He is not a pensioner.

BAGGOTT, W. H., Private, Co. K, 3d Tennessee Cavalry, aged 18 years. Conoidal ball entered and destroyed left eye, and emerged at inner angle of right eye. Pulaski, Georgia, September 25th, 1864. Discharged July 13th, 1865, and pensioned.

BALLSTETTER, CHARLES, Co. E, 74th Pennsylvania Volunteers. Conoidal ball entered near left ear, passed through lower jaw, obliquely through the upper, and destroyed the right eye. Bull Run, Virginia, August 29th, 1862. Discharged February 24th, 1863. He is not a pensioner.

BOLTON, SAMUEL M., Private, Co. D, 11th Maine Volunteers, aged 32 years. Missile, a buckshot, penetrated and destroyed the right eyeball. Bermuda Hundred, June 2d, 1864. Ball removed. Discharged April 21st, 1865, and pensioned.

BERG, JOHN, Private, Co. A, 117th New York Volunteers, aged 25 years. Gunshot wound of face. Missile carried away right eye. Fort Fisher, North Carolina, January 15th, 1865. Discharged June 22d, 1865, and pensioned.

Carpenter, J. D., Private, Co. M, 16th North Carolina Regiment. Chancellorsville, May 3d, 1863. Fracture of cranium, with loss of vision of left eye. Treated in Richmond hospital until June 18th, 1863, when he was furloughed.

CLIFTON, PERRY C., Private, Co. B, 20th Indiana Volunteers, aged 40 years. Bull Run, August 29th, 1862. Fracture of temporal and orbital bones and destruction of left eye. Alexandria hospital. Discharged October 31st, 1862, and pensioned. Vision of right eye impaired. Great deformity.

CLINTON, THOMAS, Private, Co. K, 1st United States Artillery, aged 25 years. Accidentally shot March 9th, 1865. Loss of left eye. Field and Frederick hospitals. Vision of right eye impaired. Discharged July 22d, 1865, and pensioned.

CRAIG, JAMES A., Private, Co. D, 198th Pennsylvania, aged 44 years. Gravelly Run, March 29th, 1865. Fracture of temporal bone and bones of face; right eye destroyed. Field, Washington, and Philadelphia hospitals. Impaired vision of left eye. Discharged July 27th, 1865, and pensioned.

CREW, JOHN, Private, Co. F, 12th United States Infantry. Before Richmond, latter part of June, 1862. Fracture of cranium and loss of right eye by conoidal ball. Baltimore hospitals. Discharged December 30th, 1862, and pensioned.

Coffman, H. C., Private, Co. F, 3d Arkansas Regiment, aged 19 years. Fracture of skull and loss of the left eye. Vision of right eye impaired. Petersburg hospital. Recovered.

COLE, CHARLES, Corporal, Co. A, 103d Ohio Volunteers, aged 22 years. Resaca, May 14th, 1864. Fracture of orbital and frontal processes of malar and anterior and middle roots of zygomatic process of temporal; vision and audition of left side destroyed. Field, Chattanooga, and Nashville hospitals. Discharged February 25th, 1865, and pensioned.

COLGROVE, FRANKLIN, Private, Co. H, 10th Illinois Volunteers, aged 31 years. Bentonville, March 21st, 1865. Fracture of right temporal and destruction of right eye by conoidal ball. Field, New Berne, New York, and Madison hospitals. Discharged May 26th, 1865, and pensioned.

COPENSPIRE, CHARLES, Private, Co. K, 60th New York Volunteers, aged 20 years. Winchester, September 19th, 1864. Fracture of left temporal and upper jaw; left eye destroyed. Field and Philadelphia hospitals. Several pieces of upper jaw removed. Discharged June 2d, 1865, and pensioned.

CHASE, REUBEN, Private, Co. A, 37th Massachusetts Volunteers, aged 24 years. Shell wound, fracturing maxillary and malar bones, causing total loss of right eye. Hatcher's Run, Virginia, February 7th, 1865. Admitted to Campbell Hospital, Washington, March 19th, 1865. Sent to Satterlee Hospital, Philadelphia, April 6th. Discharged July 6th, 1865, and pensioned.

Curd, J. L., Private, Co. H, 49th Virginia Regiment, aged 22 years. Gunshot wound of face. Ball entered near external angle of left eye, destroying the eye, passed through superior maxilla, and emerged below outer corner of right eye, impairing its usefulness. Seven Pines, Virginia, July, 1862. Retired from the service.

CHISHOLM, JOHN W., Private, Co. D, 46th Pennsylvania Volunteers, aged 21 years. Conoidal ball entered at outer angle of left eye, destroyed the eyeball, and emerged on right side, one inch below the eye. Peach Tree Creek, July 20th, 1864. Discharged July 27th, 1865. He is not a pensioner.

CRAWLEY, DAVID, Private, Co. C, 107th New York Volunteers, aged 23 years. Conoidal ball struck nasal bone, and passed through left eye. Chancellorsville, Virginia, May 3d, 1863. Discharged August 29th, 1864. Total loss of left eye, and partial loss of sight of right eye. He is not a pensioner.

CARTER, JOHN W., Lieutenant, Co. A, 23d U. S. Colored Troops, aged 42 years. Gunshot wound of face. Missile entered outer angle of left eye, fractured nasal bones, and emerged from inner angle of right eye. The left eye was destroyed Petersburg, Virginia, July 30th, 1864. Discharged February 6th, 1865, and pensioned.

CONNOLLY, BERNARD, Private, Co. B, 65th New York Volunteers, aged 22 years. Gunshot fracture of malar bone, with loss of use of right eye, and sympathetic affection of the left eye. Cedar Creek, Virginia, October 19th, 1864. Can but partially open the mouth. Discharged July 24th, 1865, and pensioned.

CARUTHERS, WILLIAM L., Private, Co. G, 2d West Virginia Volunteers, aged 25 years. Conoidal ball entered left antrum, and emerged through the left orbit, disorganizing the eye. Farmville, Virginia, April 6th, 1865. Discharged July 26th, 1865, and pensioned.

CRARY, PROSPER, Private, Co. F, 13th Michigan Volunteers, aged 41 years. Gunshot fracture of nasal bone; missile destroying right eye. Bentonville, North Carolina, March 19th, 1865. Discharged July 26th, 1865, and pensioned.

CASTELVECCHIO, RAFAELE, Sergeant, Co. A, 39th New York Volunteers. Gunshot fracture of superior maxilla. Sight of right eye destroyed. Bristow Station, Virginia, October 15th, 1863. Recovered, and was discharged and pensioned.

DANCE, CHARLES W., Private. Co. G, 66th New York Volunteers. Antietam, September 17th, 1862. Destruction of left eye by conoidal ball. Field and Philadelphia hospitals. Discharged November 28th, 1862, and pensioned.

DANIELS, ASA B., Private, Co. F, 5th Michigan Volunteers, aged 17 years. Hatcher's Run, March 25th, 1865. Fracture and depression of frontal bone by conoidal ball; right eye destroyed. Field, Washington, and Philadelphia hospitals. Discharged June 9th, 1865, and died December 13th, 1865.

DAVIS, CYRUS, Private, Co. G, 9th New York Cavalry, aged 22 years. Smithfield, Virginia, August 29th, 1864. Wound of right temporal region; right eye destroyed. Sandy Hook, Annapolis, and Buffalo hospitals. Discharged July 17th, 1865, and pensioned. Will probably become totally blind.

DENNIS, GEORGE W., Corporal, Co. E, 90th Pennsylvania Volunteers. Fredericksburg, December 13th, 1862. Left eye destroyed. Field, Washington, and Philadelphia hospitals. Discharged May 15th, 1863, and pensioned.

DINGER, NATHAN, Private, Co. D, 107th Pennsylvania Volunteers, aged 21 years. Gettysburg, July 1st, 1863. Loss of left eye. Camp Letterman and Philadelphia hospitals. Discharged March 8th, 1865, and pensioned.

DONOVAN, JOHN E., Private, Co. D, 2d Wisconsin Volunteers, aged 26 years. Bull Run, July 21st, 1861. Fracture of external part of left orbit; also flesh wounds of right leg, left heel, chest, right arm, and shoulder and right forearm. Taken prisoner, exchanged, and treated in Washington and New York hospitals. Vision of left eye and hearing of right ear entirely lost. Headache, giddiness, and weakness. Discharged October 19th, 1862, and pensioned.

DOYLE, BARNARD, Private, Co. C, 38th Indiana Volunteers, aged 25 years. Kenesaw Mountain, June 6th, 1864. Fracture of cranium. Loss of left eye. Savannah, New York, and Madison hospitals. Discharged June 11th, 1865, and pensioned.

DRAKE, ETHAN A., Private, Co. G, 7th Illinois Volunteers. Farmington, Mississippi, May 9th, 1862. Loss of left eye. Field hospital. Discharged November 3d, 1862.

Daniel, J. R., Private, Co. B, 1st Virginia Regiment. Gunshot wound of face. Missile entered ball of left eye and emerged at angle of inferior maxilla. Spottsylvania, May 16th, 1864. Admitted to hospital at Farmville, Virginia. Furloughed, for sixty days, September 2d, 1864.

DIMMARY, JOSEPH, Private, Co. E, 29th Connecticut Volunteers, aged 47 years. Gunshot wound of left side of face; destruction of left eye. Bermuda Hundred, September 8th, 1864. Discharged October 28th, 1865, and pensioned.

Daniel, Moses, Private, Co. B, 8th Tennessee Regiment. Gunshot fracture of superior maxilla, right eye destroyed. Franklin, Tennessee, November 30th, 1864. Transferred to Provost Marshal January 31st, 1865.

DOYLE, JOHN, Corporal, Co. C, 6th Wisconsin Volunteers, aged 25 years. Gunshot wound of face. Conoidal ball entered beneath the left eye and emerged at back of left ear, destroying the left eye. Hatcher's Run, Virginia, February 6th, 1865. Discharged August 22d, 1865.

DUVAL, ALVAY S., Private, Co. C, 111th Illinois Volunteers, aged 28 years. Gunshot wound of face, missile cutting outer canthus of right eye, fracturing orbital process of malar bone, and destroying the sight of the eye. Atlanta, Georgia, July 22d, 1864. Discharged March 8th, 1865. He is not a pensioner.

DUNN, JAMES W., Private, Co. A, 8th Illinois Volunteers. Gunshot wound of face. Missile entered left zygomatic process, passed slightly upward and backward and emerged on opposite side just above the zygoma. The optic nerve of the right eye was carried away and the eye forced forward. Vicksburg, Mississippi, June 22d, 1863. Insensible for three days. Fragments of bone thrown off. Gangrene. Mustered out July 30th, 1864, and pensioned.

DELAMATER, JOSEPH W., Private, Co. H, 124th New York Volunteers. Gunshot wound of face; left eye lost; also wound of right hand. Chancellorsville, Virginia, May 3d, 1863. Died May 25th, 1863.

ECKE, HENRY, Private, Co. H, 6th Wisconsin Volunteers. Gunshot fracture of nasal bone and extirpation of left eye. Antietam, Maryland, September 17th, 1862. Transferred to Invalid Corps, November 15th, 1863; afterward discharged and pensioned.

EATON, OLIVER P., Private, Co. G, 86th Illinois Volunteers. Jonesboro', September 1st, 1864. Fracture of frontal and destruction of right eye by conoidal ball. Field, Chattanooga, and Nashville hospitals. Discharged May 30th, 1865, and pensioned.

EGAN, BARNEY, Private, Co. F, 91st New York Volunteers. Port Hudson, June 14th, 1863. Loss of sight of left eye. Port Hudson and Baton Rouge hospitals. Right eye sympathetically affected. Discharged November 21st, 1863, and pensioned.

EGAN, JOHN, Private, Co. M, 13th New York Cavalry, aged 20 years. Piedmont, October 19th, 1864. Left eye torn out by ball; also wound of left arm. Field hospital. Right eye and nervous system generally affected. Discharged August 2d, 1865, and pensioned.

Ellis, W., Private, Co. F, 19th Virginia Regiment. Fracture of frontal and loss of left eye. Confederate hospital, Richmond. Deserted October 29th, 1862.

EVERLY, FREDERICK, Private, Co. F, 15th Missouri Regiment, aged 20 years. Springhill, December 26th, 1862. Fracture of left malar, temporal, and palate bones, and injury of right eye and left ear. Nashville, Jeffersonville, and Evansville hospitals. Hearing of left ear lost. Discharged May 11th, 1865.

ELDER, WILLIAM, Private, Co. F, 63d Pennsylvania, aged 21 years. Wilderness, May 5th, 1864. Fracture of frontal and temporal bones, eye destroyed; also wound of right foot. Field and Washington hospitals. Amputation of foot. Died May 30th, 1864.

ENDE, HENRY, Private, Co. C, 83d Pennsylvania Volunteers, aged 17 years. Cold Harbor, Virginia, June 1st, 1864. Fracture of left temporal bone, also wound of right eye. Field, Alexandria, and York hospitals. Died August 24th, 1864, from inflammation of brain.

FREE, JAMES, Private, Co. K, 55th New York Volunteers, aged 19 years. Fair Oaks, May 31st, 1862. Loss of right eye. Washington hospital. Died July 8th, 1862, of typhoid fever.

FITZGERALD, CHARLES H., Sergeant, Co. C, 138th Pennsylvania Volunteers, aged 32 years. Winchester, September 19th, 1864. Loss of right eye. Regimental, Sandy Hook, and Philadelphia hospitals. Left eye sympathetically affected. Discharged February 14th, 1865, and pensioned.

Fitzgerald, James, Private, Co. G, 5th Louisiana Regiment, aged 18 years. Rappahannock Station, November 7th, 1863. Fracture of frontal and orbital bones, loss of vision of left eye. Taken prisoner, and treated at Washington hospital. Transferred to Old Capital Prison for exchange April 14th, 1864.

FINCH, ROBERT, Sergeant, Co. B, 1st Michigan Sharpshooters, aged 22 years. North Anna River, May 25th, 1864. Fracture of frontal, temporal, and malar bones, right side, by conoidal ball. Field and Washington hospitals. Vision of right eye destroyed. Discharged October 3, 1864, and pensioned.

FOWLER, J. O., Private, Co. F, 1st Wisconsin Volunteers. Perryville, October 8th, 1862. Loss of left eye. Perryville and Louisville hospitals. Vision of right eye impaired. Discharged December 20th, 1862, and pensioned.

FUNK, DAVID, Corporal, Co. I, 5th Pennsylvania Reserves. Fredericksburg, December 13, 1862. Fracture of cranium, and sight of left eye destroyed. Field, Washington, and Philadelphia hospitals. Amaurosis of right eye. Discharged March 3d, 1863, and pensioned.

GOFF, JOHN, Private, Co. E, 11th Ohio Cavalry. Fracture of frontal bone, and destruction of right eye. Regimental hospital. Left eye sympathetically affected. Discharged December 4th, 1865. Pension claim pending.

GREENLEAF, JAMES M., Private, Co. C, 145th Pennsylvania Volunteers. Fredericksburg, December 13th, 1862. Fracture of frontal bone, and loss of right eye; also fracture of lower jaw. Field and Washington hospitals. Discharged April 6th, 1863, and pensioned.

GRIER, SYLVANUS, Private, Co. K, 124th New York Volunteers. Chancellorsville, May 3d, 1863. Loss of right eye. Field hospital. Discharged November 1st, 1864. Left eye subsequently became very defective. Pensioned.

GUNST, PETER, Private, Co. I, 2d Michigan Volunteers, aged 21 years. Petersburg, June 17th, 1864. Loss of right eye. Also fracture of ring finger of right hand, necessitating amputation. Field and Washington hospitals. Discharged July 28th, 1865, and pensioned.

Godwin, H. W., Sergeant, Co. C, 5th North Carolina Regiment, aged 26 years. Gunshot wound of face. Ball entered the right eye, completely destroying it, and remained imbedded in the bony structure of the face. Cedar Creek, Virginia, October 19th, 1864. Sight of left eye impaired.

GROVER, JOHN, Private, Co. C, 11th Connecticut Volunteers, aged 23 years. Gunshot wound of left side of face; loss of left eye. Drury's Bluff, Virginia, May 16th, 1864. Returned to duty December 15th, 1864. He is not a pensioner.

GUNTHER, JOHN, Private, Co. A, 16th Michigan Volunteers, aged 27 years. Rappahannock Station, Virginia, November 7th, 1863. Shell wound, destroying globe of left eye. Washington hospital. Discharged March 20th, 1864, and pensioned.

GAILEY, ANDREW, Private, Co. G, 104th Ohio Volunteers, aged 44 years. Gunshot fracture of left malar bone; eye destroyed. Franklin, Tennessee, November 30th, 1864. Discharged May 18th, 1865.

GENUNG, CALVIN, Private, Co. A, 109th New York Volunteers, aged 44 years. Gunshot fracture of malar bone and destruction of right eye. Weldon Railroad, Virginia, August 19th, 1864. Spiculæ of bone removed at various times. Discharged January 25th, 1865. A. M. M., Photographic Series, Vol. II, page 1. He is a pensioner.

GIER, JOHN, 1st Missouri Cavalry, aged 40 years. Gunshot fracture of jaw; destruction of right eye. Fair Oaks, Virginia, October 13th, 1864. Transferred to Veteran Reserve Corps, and discharged July 28th, 1865. He is not a pensioner.

GAILEY, WILLIAM R., Sergeant, Co. C, 40th Indiana Volunteers. Chattanooga, November 25th, 1863. Fracture of frontal and left malar bones, with loss of left eye. Field hospital. Died December 23d, 1863.

Groves, J. P., Captain, Co. B, 1st Louisiana Regiment. Monocacy, July 9th, 1864. Fracture of temporal and orbital bones, with loss of left eye. Frederick hospital. Died July 18th, 1864.

HAIGHT, W. J. T., Private, Co. K, 151st New York Volunteers, aged 20 years. Monocacy Junction, July 9th, 1864. Fracture of right temporal and loss of right eye by conoidal ball. Frederick, Baltimore, and Philadelphia hospitals. Discharged April 18th, 1865, and pensioned.

Harman, H V., Captain, Co. G, 2d North Carolina Regiment. Fracture of left temporal and orbital bones; sight of left eye destroyed. Baltimore hospitals. Sent to post prison at Fort McHenry, June 9th, 1865.

HARPER, ROBERT, Private, Co. M, 102d Pennsylvania Volunteers, aged 22 years. Wilderness, May 5th, 1864. Fracture of right frontal with depression, and destruction of right eye, by conoidal ball. Washington and Pittsburg hospitals. Discharged November 14th, 1864, and pensioned.

HAVEN, FRANCIS M., Private, Co. H, 17th Kentucky Volunteers, aged 20 years. Shiloh, April 6th, 1862. Fracture of frontal bone, with loss of right eye. Discharged August 29th, 1862.

HEMMER, PETER, Corporal, Co. I, 30th Indiana Volunteers. Murfreesboro', December 31st, 1862. Loss of left eye. Field, Nashville, and Louisville hospitals. Discharged September 24th, 1864, and pensioned.

HENRY, EDWIN, Private, Co. A, 2d United States Artillery, aged 32 years. City Point, July 23d, 1864. Fracture of frontal bone and loss of right eye. Field and New York hospitals. Discharged January 12th, 1865, and pensioned.

Hill, Isaac, Private, Co. C, 24th Virginia Regiment, Gettysburg, July 1st, 1863. Fracture of frontal and destruction of left eye. Taken prisoner. Gettysburg and Baltimore hospitals. Paroled September 25th, 1863.

HOUTS, GEORGE W., Lieutenant, 7th Missouri Cavalry, aged 37 years. Jefferson City, October 6th, 1864. Fracture of orbital and temporal bones and loss of left eye by conoidal ball. Jefferson City hospital. Returned to duty November 3d, 1864; discharged April 20th, 1865, and pensioned.

HAVENS, MORTON, Lieutenant, Co. H, 7th New York Heavy Artillery, aged 26 years. Gunshot fracture of left superior maxilla, with loss of left eye. Petersburg, Virginia, June 16th, 1864. Transferred to Veteran Reserve Corps November 11th, 1864; discharged and pensioned.

HUFFMAN, J. D., Private, Co. E, 7th Pennsylvania Volunteers. Gunshot wound through nose and loss of one eye. Admitted to Georgetown College Hospital September 6th, 1862. Discharged December 3d, 1862. He is not a pensioner.

HUNTSINGER, HENRY J., Private, Co. A, 48th Indiana Volunteers. Gunshot wound of right eye and fracture of lower jaw. Admitted to Hospital No. 2, Paducah, Kentucky, November 1st, 1862. Discharged December 26th, 1862, with loss of right eye, and pensioned. In February, 1869, he was losing the sight of his left eye.

HOLM, JOHN H., Private, Co. D, 80th Illinois Volunteers. Gunshot fracture of nasal bones and injury of right eye; sight destroyed. Day's Gap, Alabama, April 30th, 1863. Returned to duty September 7th, 1863; discharged and pensioned.

HOLLEY, JOHN, Private, Co. G, 58th Massachusetts Volunteers, aged 17 years. Gunshot fracture of malar bone and loss of left eye. Cold Harbor, Virginia, June 3d, 1864. Returned to duty January 23d, 1865; discharged and pensioned.

HINDS, PETER, Private, Co E, 17th New York Volunteers, aged 45 years. Gunshot fracture of right malar bone and destruction of right orbit. Jonesboro', Georgia, September 1, 1864. Discharged May 22d, 1865. Not a pensioner.

HOOVER, THOMAS A., Corporal, Co. D, 107th Pennsylvania Volunteers, aged 16 years. Gunshot wound of face. Missile entered just below the inner angle of left eye, crushed through the superior maxilla back of nasal bones, passed transversely backward through right eye, destroyed it, and emerged three-fourths of an inch in front of upper lobe of right ear. Gettysburg, Pennsylvania, July 1st, 1863. Intense tumefaction of right side of face supervened. Lower eyelid everted. August 7th, wounds had healed. Transferred to Invalid Corps, December 31st, 1863. Not a pensioner.

HEWITT, EDWARD G., Private, Co. H, 15th Massachusetts Volunteers. Gunshot wound of face. Missile entered under left eye, fracturing the bone badly. Fair Oaks, Virginia, May 31st, 1862, Missile not recovered. Left eye nearly blind. A sinus opened near left ear, discharging pieces of bone and pus. Discharged February 18th, 1863, and pensioned.

Haskins, John C., Private, Co. B, 24th Texas Cavalry, aged 24 years. Fragment of shell struck left side of face, carrying away the entire malar bone and destroying left eye. Arkansas Post, January 11th, 1863. Recovered and sent to prison May 4th, 1863.

HELPER, JOHN, Private, Co. L, 14th Pennsylvania Cavalry, aged 23 years. Conoidal ball entered near the external angle of the left orbit, passed through the ball, inward and downward through the posterior nares, and lodged opposite the angle of the right inferior maxilla, in the sterno-cleido-mastoid muscle. Greenbrier, Virginia, August 26th, 1863. Missile removed. Transferred to Veteran Reserve Corps. Not a pensioner.

HILL, GEORGE, Sergeant, Co. G, 64th Ohio Volunteers. Chattanooga, November 25th, 1863. Musket ball entered left eye, destroying it, and emerged on right side of face, near angle of jaw, fracturing the superior maxilla. Vision of right eye impaired. Cumberland hospital. Discharged August 17th, 1864, and pensioned.

ILSLEY, NATHANIEL, Private, Co. I, 35th Massachusetts, aged 27 years. Cold Harbor, June 5th, 1864. Fracture of frontal bone and loss of left eye. Field, Washington, and Portsmouth hospitals. Secondary hæmorrhage. Returned to duty October 13th, 1864; discharged June 9th, 1865, and pensioned.

Jesse, T. S., Private, Co. A, 29th Virginia Regiment. Fracture of spine of scapula and orbital process of frontal bone, right side; right eye involved. Richmond hospital; no result recorded.

JOHNSON, JOHN, Private, Co. H, 49th Ohio Volunteers, aged 19 years. Buzzard Roost, May 9th, 1864. Fracture of left temporal and destruction of left eye. Field, Louisville, Camp Dennison, and Columbus hospitals. Right eye impaired: vertigo. Discharged June 2d, 1865, and pensioned.

JONES, EDWIN R., Private, Co. E, 7th Illinois Volunteers, aged 23 years. Allatoona, October 5th, 1864. Fracture of outer edge of right supra-orbital ridge, with loss of eye, by conoidal ball. Field, Nashville, Jeffersonville, and Springfield hospitals. Removal of fragments. Returned to duty February 28th, 1865; discharged May 13th, 1865, and pensioned.

JOYCE, PATRICK, Private, Co. A., 115th New York Volunteers, aged 25 years. Petersburg, June 29th, 1865. Fracture of frontal bone at left orbital ridge, with loss of left eye. Field, Point Lookout, and Washington hospitals. Transferred to Veteran Reserve Corps February 25th, 1865; discharged June 28th, 1865, and pensioned.

Jacobs, John W., Private, Co. F, 54th North Carolina Regiment, aged 30 years. Gunshot wound of face. Missile destroyed the right eye and passed out at the angle of the superior maxilla, fracturing the bone. Fisher's Hill, Virginia, September 22d, 1864. Examined, to be retired, March 14th, 1865.

Jones, John, Private, Co. B, 3d South Carolina Battery. Missile entered the superior maxillary of left side about one and a half inches in front of the ear and passed out just back of the outer angle of right eye, destroying the globe of the right and the sight of the left eye. South Mountain, Maryland, September 14th, 1862. Loss of sensation in left cheek; difficulty in opening mouth. The pupil of left eye contracted and not sensible to light. Returned to duty December 13th, 1862.

KENYON, PARIS, Private, Co. B, 105th Illinois Volunteers. Atlanta, August, 1864. Fracture of left supra-orbital ridge and nasal bones; eye destroyed. Field hospital. Died August 16th, 1864.

KENYON, ELIAS W., Private, Co. A, 154th New York Volunteers, aged 34 years. Pine Knob, June 15th, 1864. Fracture of frontal bone and destruction of right eye. Field, Nashville, and Louisville hospitals. Vision of left eye impaired. Discharged December 28th, 1864, and pensioned.

KERR, MICHAEL, Private, Co. D, 7th Rhode Island Volunteers. Fredericksburg, December 13th, 1862. Fracture of frontal bone, with loss of left eye. Field and Washington hospitals. Vision of right eye very imperfect. Discharged from service February 5th, 1863, and pensioned.

KILES, JACOB B., Private, Co. F, 110th Ohio Volunteers, aged 20 years. Cold Harbor, June 3d, 1864. Loss of left eye. Field, Washington, York, and Philadelphia hospitals. Discharged June 14th, 1865, and pensioned.

KIMBERLIN, JOHN, Private, Co. E, 9th Illinois Volunteers, aged 20 years. Fort Donelson, February 15th, 1862. Loss of left eye. Cincinnati hospital. Discharged August 14th, 1862, and pensioned.

KUHN, OLIVER, Private, Co. L, 198th Pennsylvania Volunteers, aged 19 years. Hatcher's Run, March 29th, 1865. Fracture of portions of malar and sphenoid bones and destruction of right eye. Field, Washington, and Philadelphia hospitals. Discharged June 28th, 1865, and pensioned.

Killingsworth, P. D., Private, Co. I, 51st Georgia Regiment. Gunshot wound of face. Missile destroyed the right eye and fractured upper and lower jaw. Chancellorsville, Virginia, May 3d, 1863. Retired from service April, 1865. Can open the mouth but little and is unable to masticate.

KENYON, DAVID, Private, Co. C, 3d Maryland Volunteers. Gunshot wound of left side of face. Destruction of left eye and fracture of left superior maxillary bone. Antietam, Maryland, September 17th, 1862. Discharged April 16th, 1863, and pensioned.

KEMP, CHARLES, Private, Co. B, 11th Connecticut Volunteers. Gunshot fracture of superior malar bone; left eye destroyed. Antietam, Maryland, September 17th, 1862. Discharged February 6th, 1863. Sense of smell destroyed. He is a pensioner.

LEMON, MOSES W., Lieutenant, Co. I, 14th New York Heavy Artillery, aged 34 years. Washington, March 1st, 1865. Fracture of temporal bone with loss of left eye. Washington hospital. Discharged May 6th, 1865, and pensioned.

LINDSAY, JOSEPH, Private, Co. C, 72d Pennsylvania Volunteers, aged 27 years. Malvern Hill, July 1st, 1862. Fracture of temporal and loss of right eye. Baltimore hospital. Discharged November 16th, 1862, and pensioned.

LYNDE, JAMES H., Lieutenant, Co. I, 14th New York Heavy Artillery. Fort Steadman, February 25th, 1865. Fracture of frontal bone, with loss of right eye. Field and City Point hospitals. Discharged August 26th, 1865, and pensioned.

LEWIS, H. B., Private, Co. A, 121st New York Volunteers, aged 18 years. Gunshot wound of face, with loss of right eye. Ball entered middle of right eyebrow and exit through mouth. Chancellorsville, Virginia, May 3d, 1863. Returned to duty September 9th, 1863. Discharged and pensioned.

LOMAS, WILLIAM, Private, Co. H, 2d Pennsylvania Heavy Artillery, aged 30 years. Gunshot wound of face, left eye destroyed. Petersburg, Virginia, June 18th, 1864. Removal of several spiculæ of bone. The lower eyelid is drawn to a V shape and attached to the malar bone. Discharged May 16th, 1865. Not a pensioner.

LYNCH, PATRICK, Private, Co. F, 6th Vermont Volunteers, aged 35 years. Gunshot wound of face. Musket ball entered left cheek in front of ear and emerged at the side of the nose. Charlestown, Virginia, August 21st, 1864. Left eye completely gone; right eye very weak. Discharged May 5th, 1865, and pensioned.

LEECH, ALBERT G., Private, Co. H, 2d Vermont Volunteers, aged 25 years. Gunshot wound of face. Conoidal ball entered at right supra-orbital arch, destroyed eye and passed into mouth. Cedar Creek, Virginia, October 19th, 1864. Paralysis of right side of face; mastication and speech difficult. Discharged May 12th, 1865, and pensioned.

LACKEY, WILLIAM J., Private, Co. H, 102d Pennsylvania Volunteers, aged 35 years. Gunshot wound of face. Conoidal ball entered just anterior to inner angle of right eye, fractured the nasal bones, passed directly through left eye and emerged just posterior to its outer angle. Cedar Creek, Virginia, October 19th, 1864. November 22d, the wound has nearly healed. Discharged February 27th, 1865, and pensioned.

LARIMER, ISAAC, Sergeant, Co. K, 35th Illinois Volunteers. Missile entered the right malar bone, close under orbit, fractured and destroyed a portion of orbital process, passed through palate bone into the mouth, grazed ramus of left inferior maxilla, and emerged through left side of neck. Discharged September 27th, 1864. Loss of vision of left eye. He is a pensioner.

LIPPINCOTT, DENIS, Private, Co. D, 5th United States Infantry. Gunshot fracture of superior maxillary and nasal bones; loss of right eye. Valverde, New Mexico, February 21st, 1862. Discharged June 25th, 1862, and pensioned.

MCCOY, JOHN P., Private, Co. H, 77th Illinois, Volunteers, aged 22 years. May 16th, 1863. Loss of right eye. Memphis hospital. June 15th, secondary hæmorrhage from temporal artery. Returned to duty July 20th, 1863. Partial blindness of left eye. Discharged March 7th, 1865, and pensioned.

MCEWING, HENRY, Private, Co. D, 2d Michigan Volunteers. Petersburg, December 11th, 1864. Loss of right eye. Field, City Point, Baltimore, and Philadelphia hospitals. Ball extracted. Left eye sympathetically affected. Discharged June 23d, 1865, and pensioned.

MARION, THOMAS, Private, Co. I, 108th Ohio Volunteers, aged 25 years. Kenesaw Mountain, June 20th, 1864. Fracture of frontal bone, and loss of left eye. Field, Nashville, Louisville, and Camp Dennison hospitals. Discharged May 31st, 1865, and pensioned.

MASTERS, AQUILLA, Sergeant, Co. E, 14th Ohio Volunteers, aged 23 years. Chickamauga, September 20th, 1863. Fracture of right temporal bone, with loss of vision of right eye. Field, Chattanooga, Nashville, and Columbus hospitals. Discharged July 11th, 1864, and pensioned.

MILLER, JOHN W., Private, Co. K, 55th Pennsylvania Volunteers. Pocotaligo, Virginia, October 22d, 1862. Fracture of frontal and temporal bones, with loss of right eye. Hilton Head hospital. Hearing of right ear impaired. Discharged December 14th, 1862, and pensioned.

MILLER, WILLIAM H., Private, Co. B, 3d New York, Artillery, aged 23 years. Honey Hill, November 30th, 1864. Injury of frontal and temporal bones, and destruction of right eye. Hilton Head hospital. Discharged May 9th, 1865, and pensioned.

MORGAN, JAMES E., Corporal, Co. K, 15th Iowa Volunteers, aged 22 years. Cedar Bluff, September 2d, 1864. Fracture of frontal and nasal bones, with injury to left eye. Field and Keokuk hospitals. Nearly complete loss of vision of left eye, and impaired hearing of left ear. Discharged July 26th, 1865, and pensioned.

MOORE, WILLIAM, Private, Co. F, 119th Pennsylvania Volunteers, aged 36 years. Rappahannock Station, Virginia, November 7th, 1863. Loss of left eye. Washington and Philadelphia hospitals. Incipient and progressive amaurosis of right eye. Discharged March 22d, 1865, and pensioned.

MURPHY, HUGH, Private, Co. D, 17th Wisconsin Volunteers, aged 30 years. Bentonville, North Carolina, March 21st, 1865. Fracture of angle of left orbit, and destruction of left eye. Field, New Berne, New York, and Madison hospitals. Discharged May 23d, 1865, and pensioned.

MCMILLER, JOHN, Private, Co. A, 32d Iowa Volunteers, aged 28 years. Gunshot wound of face. Missile struck the right maxillary bone, and splitting, passed through the right eye and right frontal sinus. Pleasant Hill, Louisiana, April 9th, 1864. The two pieces of ball were extracted. Discharged February 14th, 1865. Pension of eight dollars per month granted February 14th, 1865. Softening of the brain supervened. Constant headache and other cerebral symptoms.

MUCKEL, WILLIAM, Private, Co. H, 3d New York Volunteers, aged 21 years. Gunshot wound of left side of face, destruction of eye. Petersburg, Virginia, July 30th, 1864. Transferred to Veteran Reserve Corps, May 4th, 1865. Discharged and pensioned.

MYERS, MICHAEL, Sergeant, Co. F, 72d Illinois Volunteers, aged 42 years. Gunshot fracture of nasal bone, with loss of left eye. Franklin, Tennessee, November 30th, 1864. Discharged May 6th, 1865, and pensioned.

MARCY, EDWARD, Private, Co. D, 91st Ohio Volunteers, aged 41 years. Gunshot wound of face. Conoidal ball entered left malar bone and emerged through right malar bone, destroying sight of left eye. Winchester, Virginia, September 19th, 1864. Transferred to Veteran Reserve Corps, February 10th, 1865. He is not a pensioner.

MINKLER, GEORGE W., Private, Co. C, 128th New York Volunteers, aged 21 years. Gunshot fracture of superior maxilla and nasal bones. Cedar Creek, Virginia, October 19th, 1864. Blepharo-conjunctivitis of left eye. Loss of use of right eye. Discharged May 20th, 1865, and pensioned.

MINER, HENRY, Private, Co. C, 10th Vermont Volunteers, aged 36 years. Gunshot fracture of nasal bones; missile passed through ball of left eye. Winchester, Virginia, September 19th, 1864. Ball extracted from cavity of eye. Left eye completely gone, right eye very weak. Discharged April 6th, 1865, and pensioned.

Mengham, W. T., Private, Co. K, 21st North Carolina Regiment, aged 21 years. Gunshot wound of orbit; missile carried away the eye and emerged from the nose. Fort Fisher, North Carolina, January 13th, 1865. Released June 28th, 1865.

Millard, Isidore, Private, Co. H, 10th Missouri Cavalry, aged 29 years. Missile entered anterior to meatus auditorius externus, passed forward and downward and emerged at right orifice of anterior nares, destroying sight of right eye. Selma, Alabama, April 2d, 1865. Discharged May 31st, 1865. Not a pensioner.

Morrison, Hugh, Sergeant, Co. C, 100th Pennsylvania Volunteers. Gunshot wound of face. Missile entered behind left mastoid process and emerged through left eye, carrying away the eye. South Mountain, Maryland, September 14th, 1862. Discharged November 27th, 1862. Left side of face paralyzed. Great deformity. Cannot shut the right eye. He is a pensioner.

Martin, Thomas B., Private, Co. E, 96th Illinois Volunteers. Gunshot wound of face. Conoidal musket ball entered right eye, completely destroyed the eyeball and fractured the orbital and nasal bones. Chickamauga, Tennessee, September 20th, 1863. Several hæmorrhages occurred, which were controlled by pressure at first, and afterward by ligation of right common carotid immediately above the omo-hyoid muscle. Died December 19th, 1863.

McGrady, Jacob, Private, Co. F, 37th North Carolina Regiment. Gettysburg, July, 1863. Gunshot wound of eye. Gettysburg hospital. Died July 14th, 1863.

Noblet, Peter, Sergeant, Co. I, 23th Wisconsin Volunteers, aged 26 years. Gunshot fracture of nasal bones; conoidal ball passed transversely and destroyed the right eye. Spanish Fort, Alabama, March 30th, 1865. Mustered out September 23d, 1865, and pensioned.

Nichols, Norman J., Private, Co. G, 2d Vermont Volunteers. Gunshot wound of face. Conoidal musket ball entered at outer angle of right eye, fractured malar bone and emerged under the inferior maxilla. Wilderness, Virginia, May 5th, 1864. Sight of right eye destroyed. Discharged May 27th, 1865, and pensioned.

Nash, J. P., Private, Co. A, 21st Virginia Regiment, Gettysburg, July 2d, 1863. Loss of right eye. Farmville hospital. Retired from service June 3d, 1864.

Neale, Fielding, Adjutant, 96th New York Volunteers, aged 36 years. Petersburg, June 25th, 1864. Loss of right eye. Point of Rocks, Fort Monroe, and Annapolis hospitals. Discharged November 26th, 1864.

O'Donnell, James, Sergeant, Co. A, 7th Illinois Volunteers. Gunshot fracture of right malar bone, eye destroyed. Allatoona, Georgia, October 5th, 1864. Returned to duty February 9th, 1865. Discharged and pensioned.

Oakball, Ned, Private, Co. D, 2d Indian Home Guard, aged 23 years. Conoidal ball entered at the right eye and emerged posterior to the left side of mouth. Fort Gibson, Cherokee Nation, April 7th, 1864. Loss of right eye. Returned to duty May 31st, 1865. Not a pensioner.

Packard, Albert H., Captain, Co. G, 31st Maine Volunteers. Wilderness, May 6th, 1864. Penetrating fracture of cranium by musket ball, which lodged in brain substance; eye destroyed. Field and Washington hospitals. Died May 16th, 1864.

Peeler, John, Private, Co. K, 134th New York Volunteers. Gunshot wound of face. Missile struck the margin of the auditory canal of right side, passed forward and inward through the socket of the right eye, and lodged just within the internal angle of the orbit. Gettysburg, Pennsylvania, July 1, 1863. Ball removed August 3d. Eye was completely destroyed. Died August 23d, 1863.

Percifield, W. J., Private, Co. H, 82d Indiana Volunteers, aged 39 years. Gunshot wound through apex of nose and destruction of right eye. Atlanta, Georgia, August, 1864. Discharged June 14th, 1865, and pensioned.

Purdy, Elum, Private, Co. H, 84th Illinois Volunteers, aged 22 years. Gunshot fracture of zygoma; right eye destroyed. Buzzards Roost, May 9th, 1864. Returned to duty January 24th, 1865; discharged and pensioned.

Pott, Henry, Private, Co. D, 75th Illinois Volunteers, aged 20 years. Gunshot wound of face. Conoidal musket ball carried away nasal bones, destroyed left eye, and fractured zygomatic process of malar bone. Lovejoy Station, September 3d, 1864. Discharged January 25th, 1865, and pensioned.

Powers, J. T., Private, Co. D, 20th North Carolina Regiment. Gunshot wound of face and loss of right eye. Discharged November 30th, 1862.

Peck, George G., Corporal, Co. D, 7th Massachusetts Volunteers, aged 32 years. Fredericksburg, May 3d, 1863. Fracture of frontal bone and loss of sight of left eye. Field and Washington hospitals. Discharged December 19th, 1863, and pensioned.

Pradt, John C., Private, Co. A, 3d Wisconsin Cavalry. Baxter Springs, Kansas, October 6th, 1863. Fracture of cranium and entire destruction of left eye. Post hospital, Fort Scott. Returned to duty December 11th, 1863; discharged August 17th, 1867, and pensioned.

Pearce, James M., Private, Co. M, 11th Pennsylvania Reserves. Bull Run, Virginia, August 29th, 1862. Gunshot wound; ball entered right orbit, destroyed the right eye, passed through the face, fracturing the nasal and maxillary bones, and emerged from the opposite side, in the cervical region of the neck. Washington hospital. Discharged October 30th, 1862, and pensioned.

Raab, George, Private, Co. B, 9th Pennsylvania Reserves. Antietam, September 17th, 1862. Fracture of frontal bone, with loss of right eye. Discharged November 15th, 1862, and pensioned.

Rader, David, Captain, Co. A, 26th Indiana Volunteers. Morganzia, September 29th, 1863. Fracture of right temporal bone and destruction of right eye. New Orleans hospital. Returned to duty November 6th, 1863; discharged March 11th, 1864, and pensioned.

Ransom, Sutton, Private, Co. E, 1st United States Colored Cavalry, aged 20 years. Bermuda Hundred, June 17th, 1864. Fracture of temporal and destruction of left eye. Point Lookout hospital. Returned to duty November 14th, 1864.

REDDING, WILLIAM A., Private, Co. A, 6th New Hampshire Volunteers. Bull Run, August 30th, 1862. Loss of left eye and derangement of intellect. Washington hospital. Vision of right eye impaired. Discharged June 27th, 1863, and pensioned.

REESE, CHARLES, Captain, Co. D, 20th Indiana Volunteers. Gettysburg, July 2d, 1863. Loss of right eye. Gettysburg and Washington hospitals. Discharged October 22d, 1863.

REGLING, CHRISTOPHER, Private, Co. G, 3d Michigan Volunteers, aged 35 years. Wilderness, May 6th, 1864. Fracture of temporal bone, with loss of right eye. Field, Washington, and Detroit hospitals. Headache, vertigo, and mental aberration. Discharged August 29th, 1864, and pensioned.

REYNOLDS, DANIEL M., Corporal, Co. F, 49th Pennsylvania Volunteers, aged 21 years. Spottsylvania, May 10th, 1864. Fracture of frontal and nasal bones and destruction of right eye. Field, Washington, and New York hospitals. Imperfect vision of left eye. Returned to duty July 28th, 1864; discharged December 22d, 1864, and pensioned.

RILEY, MICHAEL, Co. K, 35th Massachusetts Volunteers. Antietam, September 17th, 1862. Loss of left eye. Frederick hospitals. Discharged December, 1862, and pensioned.

ROE, JOSEPH, Corporal, Co. C, 91st New York Volunteers, aged 28 years. South Side Railroad, April 2d, 1865. Fracture of nasal and malar bones and loss of left eye. Field and Washington hospitals. Discharged August 3d, 1865, and pensioned.

ROGERSON, ANDREW B., Lieutenant, Co. A, 20th Illinois Volunteers, aged 27 years. Chattanooga, July 16th, 1864. Fracture of temporal and nasal bones and destruction of right eye. Chattanooga and Nashville hospitals. Senses of taste and smell nearly destroyed. Discharged May 15th, 1865, and pensioned.

Ross, J. A., Private, Co. C, 36th North Carolina Regiment, aged 23 years. Destruction of left eye. Point Lookout hospital. Transferred to provost marshal April 8th, 1865.

RUTTER, E., Private, Co. E, 2d Maryland Volunteers, aged 19 years. August 19th, 1864. Wound of left temple, involving eye and nose. Richmond hospital. Returned to duty October 19th, 1864.

ROGERS, ALVIN, Private, Co. C, 77th Illinois Volunteers. Gunshot fracture of facial bones. Conoidal ball struck just over the left eyebrow, passed downward, destroying the eye, and lodged in the superior maxilla. Vicksburg, Mississippi, May 22d, 1863. Vision of right eye also impaired. Discharged July 10th, 1863, and pensioned.

REYNOLDS, D. M., Lieutenant, Co. E, 184th Pennsylvania Volunteers, aged 21 years. Conoidal ball entered at inner angle of right eye, and passed through eye and cheek; another ball lodged near head of tibia. Deep Bottom, Virginia, August 14th, 1864. Discharged December 24, 1864. Not a pensioner.

ROTHENBERGER, H., Sergeant Co. D, 48th Pennsylvania Volunteers, aged 21 years. Gunshot wound of face. Conoidal ball entered at the inner canthus of left eye, passed downward and backward, and lodged outside of angle of inferior maxilla. Petersburg, April 2d, 1865. Missile removed. Left eye was entirely destroyed. Returned to duty July 6th, 1865. Discharged and pensioned.

ROSS, JOHN M., Private, Co. H, 8th Pennsylvania Volunteers. Gunshot wound of face. Missile entered the left eye, passed obliquely through superior maxilla, and emerged opposite and near the mastoid process. Fredericksburg, December 13th, 1862. Discharged January 24th, 1863. Left eye destroyed. Pensioned.

RICHARDSON, JOHN, Private, Co. B, 14th Illinois Volunteers. Gunshot wound of face. Missile entered through inferior eyelid, near the external angle of left eye, passed between the eyeball and external wall of orbit, and lodged. Shiloh, Tennessee, April 6th, 1862. Ball removed six weeks after reception of injury. Discharged September 29th, 1862. Loss of vision of left eye, and difficulty of hearing. He is a pensioner.

SHAEFFER, PETER, Private, Co. M, 12th Ohio Cavalry, aged 18 years. Accidentally, near Lexington, June 11th, 1864. Perforating fracture of cranium; loss of left eye. Lexington hospital. Died June 12th, 1864.

SANDERS, HENRY C., Private, Co. B, 20th Maine Volunteers, aged 20 years. Spottsylvania, Virginia, May 8th, 1864. Fracture of cranium, and loss of left eye, by conoidal ball, which lodged. Field, Washington, and New York hospitals. Discharged May 26th, 1865, and pensioned.

SCHULER, JOSEPH A., Sergeant, Co. C, 3d Michigan. Mine Run, Virginia, November 27th, 1863. Fracture of angular process of temporal bone, and destruction of left eye. Regimental and Fairfax hospitals. Transferred to Veteran Reserve Corps, March 25th, 1864. Incipient cataract of right eye. Discharged June 17th, 1864, and pensioned.

SHARP, MATTHEW, Private, Co. I, 82d Pennsylvania Volunteers, aged 36 years. Sailor's Creek, Virginia, April 6th, 1865. Fracture of frontal bone, with loss of left eye. Field, City Point, and Washington hospitals. Discharged June 14th, 1865, and pensioned.

SHAVER, WILLIAM H., Private, Co. H, 3d New York Artillery. Petersburg, September 13th, 1864. Fracture of frontal bone, and destruction of right eye. Fort Monroe, and New York hospitals. Discharged June 27th, 1865.

SHELEY, GEORGE A., Lieutenant, Co. M, 1st Michigan Light Artillery. Cumberland Gap, Virginia, June 18th, 1864. Fracture of frontal bone, with loss of right eye; also fracture of right scapula, and flesh wounds of right arm and right hip. Detroit hospital. Discharged October 15th, 1864.

SHIVELY, DAVID L., Private Co. E, 114th Pennsylvania Volunteers. Gettysburg, July 2d, 1863. Loss of right eye; also fracture of right clavicle. Gettysburg, Baltimore, and Philadelphia hospitals. Discharged May 14th, 1864, and pensioned. Complete paralysis of right upper extremity.

SICKLES, WILLIAM, Private, Co. G, 73d Ohio Volunteers, aged 20 years. Resaca, May 15th, 1864. Fracture of cranium, with loss of left eye. Field, Chattanooga, Nashville, Louisville, Camp Dennison, and Columbus hospitals. Discharged June 13th, 1865, and pensioned.

SLACK, ALDEN S., Corporal, Co. I, 3d Vermont Volunteers, aged 26 years. Winchester, September 19th, 1864. Fracture of frontal bone, with loss of right eye; also fracture of right leg. Field, Baltimore, Brattleboro', and Montpelier hospitals. Discharged June 12th, 1865, and pensioned.

SLOCUM, WARREN, Private, Co. G, 111th New York Volunteers, aged 21 years. Wilderness, May 5th, 1864. Fracture of frontal, orbital, and maxillary bones, and destruction of left eye. Field, Washington, Chester, and New York hospitals. Discharged September 5th, 1864, and pensioned. Has constant pain in head, with frequent attacks of vertigo.

STATLER, RUDOLPH, Private, Co. I, 33d Missouri Volunteers, aged 20 years. Pleasant Hill, April 9th, 1864. Fracture of orbital bones, with loss of left eye. Field and Memphis hospitals. Returned to duty November 17th, 1864.

Stewart, W. N., Private, Co. G, 43d North Carolina Regiment. Spottsylvania, May 10th, 1864. Loss of left eye. Retired March 6th, 1865. Had constant pain, headache, and vertigo, and loss of sense of taste and smell. Had also occasional attacks of epilepsy.

STOKES, PATRICK, Private, Co. F, 28th Massachusetts Volunteers, aged 28 years. Spottsylvania, May 12th, 1864. Fracture of frontal bone and loss of left eye. Had previously received wounds of abdomen and foot. Field, Washington, Readville, and Worcester hospitals. Discharged July 21st, 1865, and pensioned.

STRATTON, ISAAC, Sergeant, Co. F, 7th Ohio Volunteers. Gettysburg, July 3d, 1863. Fracture of left supra-orbital arch, with loss of left eye. Seminary and York hospitals. October 1st, removal of fragments of ball. Returned to duty October 21st, 1863. Killed near Dallas, Georgia, May 25th, 1864.

SMITH, ELIAS, Private, 2d Iowa Battery. Gunshot wound of left orbit; loss of sight. Vicksburg, Mississippi, May 22d, 1863. Returned to duty September 28th, 1863. Not a pensioner.

SHAFER, ANTHONY, Corporal, Co. K, 23d Pennsylvania Volunteers, aged 22 years. Conoidal ball passed through nose and emerged at the outer corner of the right orbit, entirely destroying the right eye. Cold Harbor, Virginia, June 1st, 1864. Discharged October 14th, 1864. Not a pensioner.

SMITH, ANDREW J., Private, Co. C, 7th Wisconsin Volunteers. Conoidal ball struck right eye, passed downward, and lodged in left side of neck. Gettysburg, Pennsylvania, July 1st, 1863. Ball extracted by an incision in left side of neck. Right eye destroyed. Transferred to Veteran Reserve Corps September 9th, 1863. Not a pensioner.

SHANNON, JAMES J., Corporal, Co. B, 83d Ohio Volunteers. Gunshot wound of left eye. Arkansas Post, January 11th, 1863. Died January 19th, 1863.

SEAL, ZACHARIAH, Private, Co. B, 15th New Jersey Volunteers. Gunshot wound through eye and fracture of jaw. Discharged March 9th, 1863, and pensioned.

SLOCUM, JOHN A., Private, Co. H, 150th Pennsylvania Volunteers, aged 20 years. Gunshot fracture of nasal bone. Conoidal ball struck the outer angle of left eye, cutting the eyelid, and causing the loss of sight. Also fracture of cuboid bone by shell. Gettysburg, Pennsylvania, July 1st, 1863. Returned to duty December 12th, 1864. Discharged and pensioned.

STINER, JOSEPH, Private, Co. H, 203d Pennsylvania Volunteers, aged 21 years. Gunshot injury of jaw; right eye destroyed. Fort Fisher, North Carolina, January 15th, 1865. Discharged April 23d, 1865, and pensioned.

SHEPLER, PETER, Sergeant, Co. B, 6th Pennsylvania Reserve Corps. Gunshot fracture of right orbit; eye torn out; under lid carried away. Spottsylvania, Virginia, May 10th, 1865. Discharged July 17th, 1865. Appearance repulsive. Not a pensioner.

SEMICH, JULIUS, Private, Co. A, 26th Wisconsin Volunteers, aged 25 years. Missile entered outer angle of right orbit, destroyed right eye, passed through both superior maxillary bones and lodged at second upper molar, left side. Atlanta, Georgia, July 20th, 1864. Transferred to Veteran Reserve Corps, December 20th, 1864. Discharged and pensioned.

SENIOR, JOHN, Private, Co. B, 35th Massachusetts Volunteers. Antietam, September 17th, 1862. Gunshot fracture of superciliary ridge and frontal bone. Baltimore hospital. Discharged November 26th, 1862, and pensioned. Vertigo and impaired vision of the right eye.

Stuckley, D. H., Private, Co. H, 59th Alabama Regiment, aged 25 years. Gunshot wound of face. Conoidal ball entered over outer angle of orbit, passed downward and backward, and emerged at angle of inferior maxilla of opposite side. Right eye destroyed Spottsylvania, May 16th, 1864. Furloughed June 7th, 1864, nearly recovered.

Syntes, Sylvester, Private, Co. A, 18th Georgia Regiment, aged 19 years. Missile, conoidal ball, entered right eye, and passed out of left. Burksville, Virginia, April 6th, 1865. Released May 7th, 1865, on taking the oath of allegiance.

SUTTON, SYLVESTER, Private, Co. A, 14th Michigan Volunteers, aged 21 years. Atlanta, Georgia, August 7th, 1864. Fracture of temporal, frontal, and malar bones, with loss of vision of right eye. Field, Chattanooga, Jeffersonville, and Detroit hospitals. Discharged March 2d, 1865; died September 7th, 1866.

SWEET, LINFORD, Private, Co. A, 49th New York Volunteers, aged 24 years. Antietam, September 17th, 1862. Destruction of left eye, nose, malar and turbinated bones. Antietam and Smoketown hospitals. Great disfiguration. Discharged December 6th, 1862, and pensioned.

THOMPKINS, THOMAS, Corporal, Co. B, 14th Wisconsin Volunteers. Gunshot fracture of facial bones. Missile entered left side of nose, one-half inch below inner canthus, and emerged one-half inch in front of right ear. Right eye destroyed. Corinth, Mississippi, October 3, 1862. Discharged March 31st, 1863. Not a pensioner.

TATE, SAMUEL G., Private, Co. I, 4th United States Cavalry. Fracture of frontal bone, with loss of right eye. Louisville hospital. Returned to duty March 11th, 1863. Discharged April 22d, 1863, and pensioned.

UZELMEYER, JOHN, Private, Co. I, 1st Delaware Volunteers, aged 20 years. Wilderness, May 5th, 1864. Fracture of external table of frontal bone, with loss of left eye. Field, Washington, and Chester hospitals. Transferred to the Veteran Reserve Corps, May 6th, 1865. Discharged September 15th, 1865, and pensioned.

An unknown soldier of the 3d Alabama, admitted to Washington hospital, April 24th, 1865, from City Point. Conoidal ball lodged in orbit of left eye. Died April 30th, 1865.

VOSBURG, STEPHEN H., Sergeant, Co. F, 63d New York Volunteers, aged 24 years. Gunshot wound of face. Conoidal ball traversed base of nose, destroying right eye. Cold Harbor, Virginia, June 1st, 1864. Transferred to Veteran Reserve Corps April 5th, 1865. Discharged and pensioned.

Welton, G. W., Private, Co. F, 12th Virginia Regiment. Loss of eye. Richmond hospital. Furloughed September 7th, 1864.

WHITE, CHARLES F., Private, Co. F, 114th New York Volunteers, aged 21 years. Cedar Creek, Virginia, October 19th, 1864. Fracture of skull, and destruction, also, of right eye. Great disfiguration. Baltimore and Philadelphia hospitals. Transferred to the Veteran Reserve Corps. Discharged June 15th, 1865, and pensioned.

WHITLOCK, JOHN, Private, Co. A, 1st New Jersey Volunteers, aged 21 years. Spottsylvania, Virginia, May 11th, 1864. Fracture of orbital and temporal bones, with loss of right eye. Field, Washington, and Philadelphia hospitals. Discharged May 19th, 1865, and pensioned.

WILL, GEORGE F., Private, Co. I, 77th New York Volunteers, aged 22 years. Wilderness, May 6th, 1864. Fracture of orbital and temporal bones, with loss of left eye. Washington, Philadelphia, New York, and Albany hospitals. Sympathetic affection of right eye. Discharged December 13th, 1864, and pensioned.

WILLIAMS, ALEXANDER N., Private, Co. A, 85th Indiana Volunteers. Atlanta, Georgia. Fracture of temporal, with loss of left eye. Field, Chattanooga, and Nashville hospitals. Transferred to Veteran Reserve Corps December 21st, 1864.

WITHEY, LEMON B., Private, Co. C, 136th New York, aged 25 years. Gettysburg, July 2d, 1863. Fracture of malar bone, and loss of left eye. Gettysburg, York, and Alexandria hospitals. Spiculæ extracted. Discharged May 25th, 1865, and pensioned.

WILLIAMS, ASBURY, Private, Co. D, 23d Indiana Volunteers. Vicksburg, May 19th, 1863. Fracture of cranium at base of brain, with loss of left eye. Field hospital. Died June 8th, 1863.

WAIT, ELI, Corporal, Co. B, 5th Minnesota Volunteers. Gunshot wound of face. Missile entered orbit of right eye, destroying the sight, crossed the face under the nose, and lodged in antrum of left side. Vicksburg, Mississippi, 1863. Transferred to Veteran Reserve Corps, and returned to duty December 7th, 1863. Not a pensioner.

WORKS, WRIGHT, Private, Co. B, 60th New York Volunteers, aged 20 years. Gettysburg, Pennsylvania, July 3d, 1863. Gunshot wound of facial bones, with loss of eye. Removal of spiculæ of bone and lead at various times. Returned to duty June 28th, 1864. Discharged and pensioned.

Walker, A., Private, Co. K, Palmettto Sharpshooters, South Carolina. Gunshot fracture of facial bones and loss of left eye. Petersburg, Virginia, October 7th, 1864. Furloughed for sixty days, November 4th, 1864.

WALTON, MATHEW, Corporal, Co. K, 61st Ohio Volunteers, aged 24 years. Gunshot fracture of facial bones, with loss of right eye. Peach Tree Creek, Georgia, July 20th, 1864. Left eye impaired. Discharged March 20th, 1865, and pensioned.

WILLIAMS, ORMANDO M., Private, Co. E, 5th Vermont Volunteers, aged 21 years. Gunshot fracture of bones of face; left eye destroyed. Wilderness, Virginia, May 6th, 1864. Ball remained in wound for three or four years, when it was finally removed from the throat by the patient during a choking fit. Discharged November 16th, 1864, and pensioned.

Wilford, James M., Sergeant, Co. D, 4th Tennessee Regiment. Gunshot fracture of nasal bone; right eye destroyed. Franklin, Tennessee, November 30th, 1864. Sent to provost marshal January 7th, 1865.

WEEKS, GEORGE M., Sergeant, Co. C, 56th Massachusetts Volunteers, aged 21 years. Gunshot wound of face. Conoidal ball entered at junction of right malar and frontal bones, traversed orbit and nasal cavities, and emerged at inner angle of left orbit. Petersburg, Virginia, September 30th, 1864. Loss of right eye. Returned to duty January 23d, 1865; afterward discharged and pensioned.

WATSON, THOMAS J., Private, Co. H, 115th Illinois Volunteers, aged 19 years. Gunshot wound of face. Buckshot entered half an inch to outside of right eye, passed inward and downward, and emerged from cheek, near left angle of mouth, knocking out several teeth; also fracture of right ulna in lower third. Rocky Face, May 9th, 1864. Discharged October 7th, 1864. Vision of right eye destroyed; that of left slightly impaired, as also mastication and speech. Flexion of fingers imperfect. He is a pensioner.

Of the foregoing series of two hundred and fifty-four cases of gunshot injury of one eye, twenty were fatal, the mortality being due to grave complications involving the brain or branches of large vascular trunks. In forty-one of these cases, vision in the uninjured eye became affected sympathetically, and in four instances was ultimately lost. The

aggregate of gunshot injuries of the eye reported, from which the preceding abstracts were selected, is set forth in the following table:

TABLE XI.

Table of Eleven Hundred and Ninety Cases of Gunshot Wounds of the Eye.

EXTENT OF INJURY.	Cases.	Died.	Duty.	Discharged.	Unknown.
Destroying sight of both eyes	63	17	.....	44	2
Destroying sight of right eye	393	12	87	286	8
Destroying sight of left eye	387	24	95	258	10
Destroying sight; side not given	45	11	9	17	8
Injuring sight of right eye	25	.....	9	13	3
Injuring sight of left eye	20	.....	8	8	4
Injuring sight; side not stated	6	.....	1	2	3
Undetermined cases; right eye	106	.....	71	24	11
Undetermined cases; left eye	116	.....	83	20	13
Undetermined cases; side not stated	29	.....	16	7	6
Aggregate	1,190	64	379	679	68

In ninety-one cases where the eye was destroyed, the sight of the remaining eye was impaired or sympathetically affected. The table does not include cases of burns of the face reported, not unfrequently caused by magazine explosions or the premature ignition of cartridges, when it often happened that grains of powder were driven beneath the conjunctiva and, unless promptly removed, became encysted and indelibly disfigured the sclerotica;* while yet more serious consequences, as corneal opacity, traumatic cataract, or general ophthalmitis, were not uncommon. Systematic writers on ophthalmology class with gunshot wounds of the eye, cases of injuries of that organ from bits of gravel or other hard bodies thrown up by bursting shells or by the impact of large projectiles on masonry. Such instances were, probably, infrequent in the late war, as no specific details of any examples are found recorded.† The intrusion of fragments of percussion caps into the eye was also a rare accident, but nineteen instances being mentioned in the large series of reports classified as gunshot injuries of the eye. In three of the cases, the side on which the injury was inflicted was not reported; in ten, the right, and in six, the left eye was involved. Five of the patients were returned to duty, with little impairment of vision, one was placed on modified duty in the Veteran Reserve Corps, eight were discharged, and five remain unaccounted for. It can be gleaned from the scanty details given, that the men who were returned to duty had non-penetrating injuries of the cornea or of the exposed part of the globe; that the eye was lost when the foreign body had entered the posterior chamber, and that the only recoveries after penetration of the

*Captain Worden received an injury of this sort in the famous action with the Merrimac, and it used to be said in the army that he should blush with a pardonable pride whenever he looked in the mirror.

†Lord Nelson lost an eye from this cause at the siege of Calvi, as related in a letter to his wife, August 18th, 1794. TYRRELL (Vol. I, p. 367), AMMON (*Zeitschrift*, B. III, S. 103), Dr. J. HAYS (3d Am. ed. of LAWRENCE *On the Eye*, p. 182), and MATTHEWS (*Surg. Hist. of Brit. Army in the Crimea*, p. 310), record similar cases.

anterior chamber were those in which the copper fragment was immediately extracted.* The injuries of the eye from pistol and musket balls and from fragments of large projectiles were very varied in their nature. Commonly destructive of vision, they were seldom dangerous to life, unless associated with fractures involving the cranial cavity. There were twenty-five examples, of which some particulars have been given, of recovery after the evulsion of both eye-balls by shot traversing the orbits. There were two instances (*Zimmerman* and *Ferdon*, p. 327, *ante*) of recovery after the passage of musket balls behind the orbits, from temple to temple, the total blindness that ensued, indicating the probable division of the optic nerves anteriorly to their decussation. Specimen 1,108, of the Museum (see FIG. 103, p. 205) illustrates how bullets may readily pursue this course without involving the anterior cerebral lobes. The percentage of recovery, where a single eye was torn from its socket by a bullet, was large, and the secondary lesions of the brain or of the opposite eye were less frequent, after this rude mode of extirpation, than in cases in which buckshot or small pistol balls lodged within the globe. No case is recorded explicitly of the lodgement of a ball in the orbit, without injury to the globe, unless the case of Richardson (p. 340, *ante*) may have been of that nature. Hennen met with an instance of this sort during the retreat of Sir John Moore's army to Corunna, and has described it in his fifty-second observation. (*Op. cit.* p. 346.) The flattened bullet was extracted by dressing forceps, and there was but slight irritation of the eye, "although he underwent a very distressing march that night."

The eyelids rarely escaped injury in gunshot wounds of the contents of the orbit; but in a few instances the globe was emptied by a musket ball, with slight lesion of the lids. Eversion and inversion of the lids, ancyblepharon and symblepharon, and various adhesions of the remnants of the lids to the margins of the orbit followed in many of this class of cases. A few instances are illustrated by photographs in the Museum;† others will be described with the cases of blepharoplasty, in the next section of the chapter.

Missiles seldom penetrated or destroyed the eyeball without injuring the bones forming the orbit. In the foregoing pages of this section, many instances have been cited of extensive fractures of the facial bones, associated with gunshot wounds of the eye, and in the preceding chapter may be found examples of fractures involving the frontal sinuses (p. 164, FIGS. 74 and 75) and upper osseous boundary of the orbit. Unless the lesions of bone extended to the cranial cavity the results were seldom fatal. In many instances of these distressing species of injuries, recovery took place, or the fatal result was long deferred unless complicated with cerebral mischief; the fractures of the external walls of the frontal and maxillary sinuses were not dangerous, though followed by necrosis, with interminable exfoliations and frequent abscesses. There was no carefully reported case of amaurosis induced by the division of the supraorbital nerve by balls, and nothing in the reports to sanction the assertion of MacKenzie (*Am. ed.*, 1855, p. 416) that the "wind of a ball has been known to produce amaurosis." The "wind of balls" has long been wafted out of the domain of military surgery.

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* On percussion caps lodged in the eyeball, consult CROMPTON'S account of seven cases treated by BARTON, of Manchester (*London Med. Gazette*, Vol. XXI, p. 171); *Am. Jour. of Med. Sciences*, for a case of successful removal of a fragment from the iris by Dr. N. R. SMITH; Dr. J. HAYS (*loc. cit.*, p. 182); STIÈVENART (*Ann. d'Oc.*, T. I, p. 439), CUNIER (*ibid.*, p. 440); LAWSON (*Injuries of the Eye*, p. 289) gives six cases. STOEBER (in W. W. Cooper's *Wounds and Injuries of the Eye*, London, 1869, p. 391).

† See *Photographs of Surg. Cases and Specimens*, A. M. M., Vol. I, p. 32; *Ibid.* Vol. II, p. 2; *Ibid.* Vol. II, p. 18; *Ibid.* Vol. VI, p. 9; *Ibid.* Vol. VII, p. 8; *Card Photographs of Surgical Cases*, A. M. M., Vol. I, p. 4; *Ibid.* Vol. I, p. 4; *Ibid.* Vol. I, p. 10; *Ibid.* Vol. I, p. 3; *Ibid.* Vol. I, p. 3; *Ibid.* Vol. I, p. 3; *Ibid.* Vol. I, p. 4.

Gunshot contusions of the globe of the eye were not unfrequently followed by traumatic cataract. I have searched in vain in the records for such instances of recovery from this leison as Larrey recorded (*Clin. Chir.* T. 1^e^, p. 403), of recovery of perfect vision, or even of useful vision, after unquestionable instances of wounds of the crystalline.*

A general survey of the accounts of gunshot injuries of the eye, reported during the war, instructs us that whenever foreign bodies are lodged in the globe, they should be extracted at all hazards. If it is impracticable to find them, the globe should be extirpated in order to preserve the other eye. When general opthalmitis has followed a gunshot injury, a free horizontal incision, evacuating the contents of the eyeball, should not be long delayed. Absolute rest, and strict diet, and every precaution that may conduce to the preservation of the remaining eye, should, with sedulous solicitude, be enjoined by the surgeon. In the cases complicated by fractures of the orbital region, it was plainly shown that it was unwise to remove fragments of bone primarily, unless they were so detached as to serve as foreign bodies.

In the dressing of gunshot wounds of the eyelids, often exhibiting much loss of tissue, favorable results were obtained by the careful readjustment of the mutilated parts, with coaptation by the twisted suture, the contused edges of the wound being pared in some instances. But this method of reunion, so very serviceable in wounds about the face, was not very generally employed. In cases attended by destruction of the *puncta* or of the lacrymal canals, some of them having been under the observation of pension examiners or army surgeons for six or seven years, little or no diminution in the overflow of tears took place, a result conflicting with the assertions of oculists who have obliterated the *puncta* with alleged success in cases of epiphora or stillicidium.

Artificial eyes were furnished to a few of the mutilated soldiers; but, in most instances, the destruction of tissue in gunshot injuries involving the globe of the eye, made it inadvisable to attempt the insertion of a glass eye.†

GUNSHOT FRACTURES OF THE FACIAL BONES.—Among the abstracts of wounds of the orbital region, many examples of injuries of the adjacent bones have been cited. The following one hundred and thirty-five abstracts relate mainly to cases involving the upper and lower maxillæ chiefly; but strict classification has not been attained in this series of complicated cases:

CASE.—Private James Berks, Co. K, 138th Pennsylvania Volunteers, aged 60 years, received, at the battle of Locust Grove, November 27th, 1863, a gunshot wound of the face, right side. The missile entered over the right angle of the jaw, and emerged beneath the symphysis, comminuting the jaw between both wounds. Several spiculæ of bone were removed on the

* Consult LARREY, SCARPA, HEY, HENNEN, VICQ-D'AZYR on this disputed point.

† Observations on gunshot wounds of the eye may be found in BEER, *Lehre der Augenkrankeiten*, Wien, 1792, B. 1, S. 95; in HENNEN, *Principles of Military Surgery*, 3d ed., London, 1829, p. 344; GUTHRIE, *Commentaries, etc.*, p. 523; W. W. COOPER, *On Wounds and Injuries of the Eye*, London, 1869, p. 59; BELL, *System of Operative Surgery*, London, 1814, 2d ed. p. 452; THOMSON, *Observations in the British Military Hospitals in Belgium*, Edinboro', 1816, p. 65; MACLEOD (*op cit.*), p. 223; DIXON, in *Holmes's System of Surgery*, Vol. III, p. 89, 2d ed.; LEGOUEST (*op. cit.*), p. 365; *Annales d'Oculistique*, T. III, p. 73, Bruxelles, 1840; WALKER, *Oculists' Vade-mecum*, London, 1843, p. 323; MCRAE, *Medical Report of the Campaign in the Punjaub*, p. 48; DEMOURS, *Traité des Maladies des Yeux*, Paris, 1818, Pl. 52, fig. 1; FENIN, *Ann. d'Oc.*, T. XX, p. 105; ISCHENSCHNIED, *ibid.*, T. XXX, p, 107; CARRON DU VILLARDS, *Gazette Méd. de Paris*, T. VI, c. 1; PLAYNE, *Ophthalmic Hospital Reports*, London, Vol. I, p. 216; MENIÈRE, *L'Hôtel-Dieu de Paris, en juillet* 1830, Paris, 1830; MACKENZIE, *A Practical Treatise on the Diseases of the Eye*, Am. ed. 1855, p. 412; STELLWAG and SOELBERG WELLS, in their recent treatises, add nothing to our information on the subject; STOEBER, *Ann. d'Oc.*, T. III, p. 70; CROMPTON, *London Medical Gazette*, Vol. XXI, p. 175; CASTELNAU, *Archives Général de Médicine;* LAWSON, *Injuries of the Eye, Orbit, and Eyelid*, London, 1867, p. 282; GAMA, *Traité des plaies de tête et de l' encéphalite*, 2d ed., Paris, 1835, p. 340; LAWRENCE, *On the Diseases of the Eye*, Am. ed., Phila., 1854, p. 182; DEVAL, *Chirurgie Oculaire*, Paris, 1844, p. 500; DESMARRES, *Traité des Maladies des Yeux*, Paris, 1854, 2d ed. T. I, p. 152; WALTON, *Operative Ophthalmic Surgery*, London, 1853, p. 95; MATTHEWS, *Surg. Hist. of the War in the Crimea*, Vol. II, p. 309; FARDEAU, *Jour. Gén. de Méd. et de Chir.*, T. 24, Paris, 1809, p. 287, DENONVILLIERS ET GOSSELIN, *Compendium (op. cit.)*, T. III, p. 413, Paris, 1861; PLATNER, *Institutiones Chirurgiæ*, Lipsiæ, 1758, p. 322; BAUDENS, *Cliniques de Plaies d'Armes a Feu, p.* 167; LOHMEYER, *Die Schusswunden*, Zweite Ausgabe, 1869, S. 99; BECK, *Die Schusswunden*, S. 139; OCHWADT, *Kriegschirurchische Erfahrungen*, S. 354; ROSAS, *Handbuch der theoretischen und practischen Augenheilkunde*, Wien, 1830, B. I, S. 421; DIETERICH, *Archives Générales de Médicine*, October, 1826, p. 295; HILL, *Cases in Surgery*, Case V; GARENGEOT, *Traité des Operations de Chirurgie*, T. 3^e^, p. 155.

field. He was, on December 4th, admitted to 2d division hospital, Alexandria. On admission, the right side of the jaw had fallen in considerably, and the patient was weak and anæmic. Opiates, stimulants, and tonics were administered, and chicken broth, beef tea, and farina ordered. Secondary hæmorrhage from one of the external carotid arteries occurred December 10th, amounting to ten ounces of blood, which was controlled by the application of persulphate of iron. The patient stated that he had recurrent hæmorrhages. The horizontal ramus of the lower jaw is gone, and he can eat fluid food only. He was discharged the service March 7th, 1864, and pensioned on March 15th. Examining Surgeon H. L. Hodge reports that he has great difficulty in swallowing and very imperfect speech. His mind is weakened; disability total, probably permanent. The case is reported by Acting Assistant Surgeon J. G McKee.

Case.—Private William H. Batchelder, Co. I, 16th Maine Volunteers, aged 22 years, was wounded at the battle of Gettysburg, July 1st, 1863, by a conoidal ball, which caused a compound comminuted fracture of the right lateral half of the inferior maxilla, and fractured a portion of the superior maxilla. The ball entered the right side of the face slightly above and to the outside of the right wing of the nose, passing downward and backward, shattering the body of the right superior maxilla and the first and second molars, with the alveolar process of the inferior maxilla, grazing the side of the tongue in its passage. He was sent to the 2d division hospital, First Corps. The ball was removed at the lower side of the month. Secondary hæmorrhage from the dental or facial artery occurred July 8th, amounting to about twenty ounces of blood, which was arrested by the application of stypties, and pressure. On July 19th, he was transferred to York Hospital, Pennsylvania. The patient was put under chloroform, and seven teeth, consisting of five upper and two lower, were removed, besides many pieces of the superior maxilla. Cold water dressings were applied to the wound. He was restless, and much pained, and had bad appetite. There was considerable discharge of pus in the mouth, the granulations filling the gaps in the jaws. On August 21st, the wound of entrance had closed, with some depression of its cicatrix. He could open the mouth one-half of an inch, but was unable to close it with force; spoke rather plainly, but could not speak when first wounded. He looked rather pale, had good appetite, and slept under morphia. He complained of paroxysms of pain at the root of the neck and shoulders, which yielded to wet cups and morphia; these paroxysms continued with variable intensity, and extending to the back of the head, until about the 21st of September, at which time it refused to yield to treatment. On the 22d, his face flushed, pulse frequent, irregular, and severe headache. Cups were applied to the back of the neck and cold applications to the head, which gave temporary relief. On the 23d, his condition was unchanged, save slight drowsiness. On the 24th, drowsiness increased, and blisters were applied to the back of the neck. On the 25th, coma, snoring, and death. Necrotomy showed some emaciation, and some congestion of the dura mater. The arachnoid presented an opaque appearance, most marked at the base of the brain; that portion of the brain resting upon the basilar portion of the occipital bone was deeply red, softened, and at one point presented a spot of badly organized lymph, and possibly some pus. The ventricles were distended by several ounces of very clear serum. The case is reported by Surgeon Henry Palmer, U. S. V.

Case.—Sergeant George R. Burroughs, Co. G, 12th New Jersey Volunteers, aged 23 years, was wounded at the battle of Cold Harbor, June 3d, 1864, by a conoidal ball, which fractured the ramus of the inferior maxilla. The missile entered at the middle of the ramus on the right side, and emerged below the angle on the left side, wounding the lingual and facial arteries. He was, on June 15th, admitted to Harewood Hospital, Washington. Secondary hæmorrhage from the lingual and facial arteries occurred June 17th, amounting to eighteen ounces of blood. Hæmorrhage recurred on the 20th. Free incisions were made in the course of the wound, and coagulated blood and pus cleaned out thoroughly; the hæmorrhage thereupon ceased. The constitutional treatment throughout was supporting. Died June 22d, 1864. Patient seemed to have died from exhaustion superinduced by profuse and protracted suppuration, rather than from the immediate effects of the hæmorrhage. The case is reported by Surgeon R. B. Bontecou, U. S. V.

Case.—Private James P. Benham, Co. D, 5th New York Volunteers, aged 22 years, of a nervo-sanguine temperament, and who had always enjoyed perfect health, was wounded at the second battle of Bull Run, Virginia, August 30th, 1862, by a conoidal ball, which entered the left cheek midway on a line drawn from the middle of the margin of upper lip to that of the lobe of the ear, passed along the body of the inferior maxilla, breaking out both upper and lower anterior and posterior molars, causing a compound fracture of the superior maxilla, and then striking the palate bone at its posterior edge, glanced off in an oblique direction downward and forward to the right, and lodged in the lingual muscles. He was admitted, on the next day, to the Armory Square Hospital, Washington, in an exhausted condition. Stimulants and nourishing diet were given. The ball could not be found. Spiculæ of bone were removed, and cold water dressings applied. On September 6th, the wound was suppurating freely. On September 12th, secondary hæmorrhage occurred, probably from the tonsillar or palatine arteries, which was restrained by cold applications. On October 17th, an incision was made one inch in front of the angle of the inferior maxilla, at the lower posterior edge of the gland, and the bullet extracted. It was found to be much flattened and bent, and thickly set with minute spiculæ of bone. Fomentations were applied to promote suppuration. On October 26th, the wounds in the cheek and fauces were closed, and on the 31st, the parts had assumed nearly their normal condition. He was discharged from service March 31st, 1863. Surgeon D. W. Bliss, U. S. V., reports the case. He is a pensioner, his disability being rated one-third and permanent.

Case.—Private Henry Baine, Co. C, 188th Pennsylvania Volunteers, aged 19 years, received, at the battle of Cold Harbor, Virginia, June 3d, 1864, a gunshot wound of head and face, conoidal ball entering in front of the meatus auditorius, left side, and emerging at nasal eminence, involving loss of left eye and partial destruction of internal maxillary artery. He was admitted to the Emory Hospital, Washington, on June 10th, 1864. Face much swollen; vision destroyed. Cold water dressings were applied and tonics administered. Patient did well until the evening of June 15th, when secondary hæmorrhage took place. He lost from four to six pounds of blood, necessitating operation. On June 16th, at ten A. M., Surgeon N. R. Mosely, U. S. V., ligated the common carotid artery, in superior carotid triangle, just below origin of internal maxillary artery. He died on June 26th, 1864, from exhaustion and debility. The case is reported by the operator.

Case.—Private Cyrus W. Beamenderfer, Co. A, 84th Pennsylvania Volunteers, aged 20 years, was wounded at the battle of the Wilderness, Virginia, May 6th, 1864, by a conoidal ball, which entered the left side of the face about half an inch above the angle of the mouth, taking a downward and backward course, and emerged from the left side of the neck, about three inches below the ear, and lodged in the left shoulder. The upper jaw sustained no injury, except the breaking off the first bicuspid. The left side of the under jaw was very much broken, and was resected on the field, from the joint to a point between the two bicuspids. On May 12th, 1864, hæmorrhage occurring, the primitive carotid artery was ligated just above the clavicle by Henry McClain, formerly surgeon 2d New York Volunteers. He was admitted to the 1st division hospital, Alexandria, Virginia, May 25th, and on June 20th transferred to Philadelphia, entering Satterlee Hospital on the 22d. His general health was good, and the wounds were almost entirely healed. Cerate dressings were applied. He was discharged from service November 29th, 1864 On October 5th, 1866, Pension Examiner George P. Lineaweaver reports that the muscles of the left side of the neck are so contracted that he cannot turn his head. His disability is rated total. Surgeon I. I. Hays, U. S. V., reports the case.

Case.—Private George Brown, Co. I, 25th Massachusetts Volunteers, aged 41 years, received a gunshot wound of the face at the battle of Goldsboro', North Carolina, December 14th, 1862. He was on December 20th admitted to Stanley Hospital, New Berne, North Carolina. Secondary hæmorrhage occurred January 7th, and recurred on the 9th; the loss of blood amounted to about thirty-two ounces. Cold water dressings were applied to the wound, and stimulants and tonics ordered. Patient died January 18th, 1863. The autopsy revealed an extensive comminution of the malar bone, the zygomatic arch, the antrum, and the petrous portion of the temporal bone; also laceration of the external carotid artery. The case is reported by Acting Assistant Surgeon J. B. Upham.

Case.—Private Daniel Cox, Co. F, 15th Indiana Volunteers, aged 25 years, was wounded at the battle of Missionary Ridge, November 25th, 1863, by a musket ball, which entered anterior to left angle of jaw, fracturing lower maxilla, passing under tongue, and out a little below and to the right of the great horn of the hyoid bone; also injuring the sublingual artery He was admitted to the field hospital, Chattanooga, Tennessee. Profuse bleeding from sublingual artery; wound rugged; lost four pints of blood. November 29th, Surgeon A. McMahon, U. S. V., made an incision from point of exit of ball down the neck on inside of sterno-mastoid, exposed sheath, with descendens noni nerve, and ligated right common carotid artery just above omo-hyoid. All bleeding instantly ceased. On December 1st, slight hæmorrhage; controlled by persulphate of iron. December 2d, hæmorrhage. December 3d, hæmorrhage; ligation of left external carotid; no anæsthetic was used. December 6th, weak; muscæ volitantes. December 9th, from this time did well. January 28th, 1864, feels as well as ever; maxilla not united. Left Chattanooga as well as ever, save from inconvenience of deformed jaw and inability to masticate. Cox was admitted into Hospital No. 19, Nashville, Tennessee, and discharged June 25th, 1864, and pensioned. February 3d, 1866, the wound was still discharging pus. His disability is rated three-fourths and permanent.

Case.—Brazilla S. Cobb, Co. C, 10th Maine Volunteers, aged 41 years, was wounded at the battle of Cedar Mountain, Virginia, August 9th, 1862, as he was kneeling on his right knee to discharge his gun. The missile, a small rifle or revolver ball, struck him in the mouth, driving in eight teeth, passed to base and outer side of right tonsil, and lodged apparently in the deeper muscles of the neck, in the region of the great vessels. He was admitted into the 2d division hospital at Alexandria, Virginia, August 12th, 1862, and transferred to Satterlee Hospital, Philadelphia. The treatment consisted of Dover's powders, and local applications of equal parts of chloroform and tincture of aconite, to the ear, filling the outer ear with loose cotton, bathing the surface of the face and head with croton oil. He at first had profuse hæmorrhage from the right ear as well as from the mouth, which recurred several times, with inflammation of the tonsils and fauces, accompanied by tenderness of the right cheek, extending back to the anterior edge of the trapezius. He suffered intensely from pain of the right side of the face and ear, occasioning high fever and arterial action, with intense pain in the head. He was discharged from service December 30th, 1862, and pensioned, his disability being rated one-half, and perhaps not permanent. Acting Assistant Surgeon W. P. Morgan reports the case.

Case.—Private *V. F. Clark*, Co. G, 98th Virginia Regiment, received, June 23d, 1864, a gunshot wound, which fractured the inferior maxilla. A considerable portion of bone was lost. He was admitted to the Confederate hospital at Farmville, Virginia. Secondary hæmorrhage occurred, and on October 4th he was furloughed for sixty days.

Case.—Private *W. R. Copeland*, Co. B, 61st Alabama Regiment, aged 34 years, was wounded at the battle of Winchester, Virginia, September 19th, 1864, by a conoidal ball, which entered just below the angle of the left eye and lodged in the neck, two inches to the right of the fifth cervical vertebra. He was admitted to the depot field hospital at Winchester on the same day. On October 1st, the ball was removed. On the 7th, the common carotid artery was ligated by Surgeon W. S. Love, C. S. A. Hæmorrhage recurred, five hours after ligation, from the posterior orifice, continuing until the 8th, when he died. Acting Staff Surgeon N. F. Graham reports the case.

Case.—*B. P. Cox*, Dauce's Battery, aged 25 years, received, October 7th, 1864, a gunshot wound. The missile, a conoidal ball, entered the right side of the face, below the middle of the zygoma, and passed out at the posterior edge of the symphysis of the chin. Secondary hæmorrhage occurred, which was arrested by compression. October 30th, 1864, good prospect of speedy recovery.

Case.—Corporal Charles A. Chapman, Co. E, 11th New Hampshire Volunteers, aged 18 years, was wounded at the battle of Fredericksburg, December 13th, 1862, by a conoidal ball, which shattered the superior and inferior maxilla, left side. He was, on December 20th, admitted to Carver Hospital, Washington. The ball was extracted near the clavicle. On January 5th, secondary hæmorrhage occcurred from the branches of the internal maxillary artery, amounting to sixteen ounces of blood, which was controlled by compression. He was discharged February 11th, 1863. He was pensioned, his disability being rated total.

CASE.—Sergeant Barclay Cooper, Co. B, 126th Ohio Volunteers, was wounded at the battle of the Wilderness, May 5th, 1864, by a musket ball, which entered close to the mastoid process of the right temporal bone, passed through, and lodged under the integuments in the malar bone, beneath the left eye, escaping, in its passage, all the larger vessels, but leaving an opening in the palate. He also received a gunshot wound of the scrotum. He was taken prisoner, and receiving but little attention, the wound of the scrotum became very unhealthy; vermin gathered in it, and one testicle became exposed. He states that he was operated upon by a rebel surgeon for the wound of scrotum, after which the parts healed. The wound of the face soon healed, leaving an opening in the palate about the size of a large pea. He was exchanged, and admitted to the post hospital at Camp Chase, Ohio, on January 25th, 1865, and returned to duty on February 21st, 1865. An operation was subsequently performed for the purpose of closing the opening in the palate, but without success; hæmorrhage occurred for several days, but finally succumbed under the use of styptics. He was discharged from the service June 25th, 1865. His speech was somewhat defective, and he had difficulty in swallowing. Pension Examiner A. H. Hewetson, M. D., reports the case.

CASE.—Private Elisha K. DeForest, Co. K, 86th New York Volunteers, received, at Chancellorsville, May 3d, 1863, a gunshot wound. The missile entered the upper lip, passed through the tongue, and emerged from the middle of the sterno-cleido-mastoid muscle, at its external border. He was, on May 4th, admitted to the hospital of the 2d division, Third Corps, and on the 6th transferred to Washington, and on May 8th admitted into the Mount Pleasant Hospital. Half diet was ordered, and the patient enjoined to keep quiet, and his head elevated. On May 12th secondary hæmorrhage occurred suddenly, after walking across the ward, and the patient died in a few minutes, May 12th, 1863. The autopsy showed that a part of the common carotid artery had been destroyed by the ball. The case is reported by Assistant Surgeon C. A. McCall, U. S. A.

CASE.—Private John Downey, Co. E, 73d New York Volunteers, aged 20 years, was wounded at the battle of Gettysburg, July 1st, 1863, by a conoidal ball, which entered behind and above the lobe of the right ear, passed horizontally across, carrying away the alveolar process of the superior maxilla, and lodged two inches from the tragus of the left ear, one and a half inches from the base of the occipital bone. He was taken to a field hospital, where the operation of exsection was performed. He was admitted into the Seminary Hospital, Gettysburg, July 2d, 1863, and transferred to Turner's Lane Hospital on the 11th, when a large abscess burst in the posterior part of the cavity of the mouth. The fractured surface of bone was discharging pus freely, also slightly at the external orifice, the wound of the upper lip was healed, pain very slight. The treatment consisted of cold water dressings, nourishing diet, and on July 13th, extraction of ball. On the 20th, a slough formed in the external wound; the discharge was foul. Simple dressings were continued, with injections of Labarraque's solution into the wound. On the night of August 6th, profuse hæmorrhage from the external wound occurred, which was arrested by pressure upon the external carotid, and the free application of persulphate of iron. The amount of blood lost was thirteen ounces. August 11th, he was transferred to Christian Street Hospital in an improving condition. The dressing was removed from the external wound, which presented a clean, healthy surface. The discharge was free. The treatment was continued, with the free use of stimulants. By October 1st, the wound and general health of patient were improving. A small spicula of bone was removed. He was discharged from the service November 22d, 1864. The case is reported by Assistant Surgeon C. H. Alden, U. S. A. The patient is not a pensioner.

CASE.—Private William W. Davis, Co. E, 114th Pennsylvania Volunteers, aged 20 years, was wounded at the battle of Chancellorsville, May 3d, 1863, by a conoidal ball, which fractured the upper maxilla. The missile entered the mouth and emerged at the middle of the left cheek, tearing out two inches of outer angle of mouth and destroying seven upper teeth and corresponding alveolar process. He was, on May 8th, admitted to Mount Pleasant Hospital, Washington. Simple dressings were applied to the wound. May 14th, secondary hæmorrhage occurred from the facial artery, amounting to about two ounces of blood, which was controlled by pressure. On June 1st, he was transferred to Philadelphia, and admitted into the Satterlee Hospital, whence he was transferred to the 2d battalion, Invalid Corps, September 4th, 1863. He is a pensioner; has very considerable deformity, and neuralgic pains in face in damp weather. Disability, three-fourths and permanent. The case is reported by Assistant Surgeon C. A. McCall, U. S. A.

CASE.—Private Dennis Edwards, Co. A, 11th Massachusetts Volunteers, aged 30 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a gunshot missile, which fractured the inferior maxilla. He was admitted into the hospital of the 1st division, Third Corps, and from thence was admitted into Carver Hospital, at Washington, on May 9th, 1863. There was hæmorrhage from the facial artery, which recurred. The treatment consisted of compress and cold applications. He died on May 9th, 1863, of hæmorrhage.

CASE.—Private James Edgar, Co. G, 81st Pennsylvania Volunteers, aged 23 years, was wounded at the battle of Gettysburg, July 2d, 1863, by a conoidal ball, which fractured the inferior maxilla. The missile entered the left side of the neck one-half of an inch below the ear, fracturing the lower maxilla in two places, and crossing beneath the tongue, emerged at the right angle of the mouth. He was, on July 10th, admitted to Broad and Cherry Streets Hospital, Philadelphia. On admission, the patient was exhausted from want of food and rest. Injections of milk punch and beef essence were administered. Several spiculæ of bone were removed, and Barton's bandages applied to the fractured jaw. Secondary hæmorrhage from the left lingual artery occurred July 10th, and recurred on the 11th and 12th, amounting to about twenty ounces of blood, which was controlled by pressure. Pulse 100 and feeble; the wound of entrance gaping and indolent, and tongue swollen. As soon as the patient could take liquor by stomach he improved rapidly. No attempts made to keep the parts in apposition until the close of the sixth week. On September 10th, the union was quite firm, with very little deformity. On September 26th, an abscess, which had formed, discharged pus freely with fragment of ball. A small portion of bone was found necrosed. On October 1st, the patient was convalescent, with no deformity. He was returned to duty January 12th, 1864. The case is reported by Acting Assistant Surgeon William V. Keating. He is a pensioner. On November 10th, 1869, Pension Examiner N. B. Reber reports that the left side of the face is paralyzed; he is unable to close the left eye, rendering it sometimes very weak and sore, which the right eye sympathizes with and deranges vision. The tongue is partially paralyzed and has grown fast to the jaw, rendering mastication impossible and deglutition difficult. He uses soft food and liquids entirely. Speech imperfect. The wound in the jaw still continues to discharge internally. He rates his disability as permanent.

Case.—Private *Hiram Fitzgerald*, Co. E, 3d Virginia Cavalry, aged 24 years, was wounded at Old Church, Virginia, May 29th, 1864, by a conoidal ball, which fractured the inferior maxilla. The missile passed from a point midway between the angle of the mouth on the left side, to the neck below, and behind the angle of the jaw on the right side. He was, on June 5th, admitted to Lincoln Hospital, Washington. Secondary hæmorrhage from the branches of the facial and internal maxillary arteries occurred June 5th, and recurred on the 6th, amounting to three pints of blood, which was controlled by approaching syncope and injections of ice water into the mouth. The patient lived seven hours after the last visible hæmorrhage, but never rallied, although stimulants were freely administered. The case is reported by Assistant Surgeon J. C. McKee, U. S. A.

Case.—Corporal R. J. F———, Co. F, 60th New York Volunteers, aged 22 years, was wounded at the battle of Fredericksburg, May 3d, 1863, by a conoidal ball, which fractured the superior and inferior maxilla. The ball entered the ala of the nostril, and passed downward and backward, splitting the ramus of the inferior maxilla, and emerged by two openings in front and below the pinna of the right ear. The superior maxilla of right side was destroyed, and the right portion of the inferior fractured and comminuted, and fissures running into the orbital process. He was, on May 7th, admitted to Carver Hospital, Washington. Cold water dressings and bandages were applied. Slight hæmorrhage from the internal maxillary artery occurred at ten and eleven o'clock P. M., May 9th, which yielded to compression; it again recurred profusely at twelve o'clock, amounting to about fifty fluid ounces of blood; attempts at compression of the carotid artery were unsuccessful, the patient being unmanageable from fear; during the remainder of the night and the day following, he was kept in a sitting posture, and ice retained in his mouth, and strictly forbidden to speak. At two o'clock P. M. on the 11th, his pulse being on the increase, six drops of the tincture of aconite was ordered. The hæmorrhage returned in the evening, the patient became frantic with alarm, and prevented all attempts at compression. He died immediately. The autopsy revealed great comminution of the superior and inferior maxilla, and that the hæmorrhage proceeded from the trunk of the internal maxillary artery. The specimen is figured in the wood-cut. The case is reported by Acting Assistant Surgeon E. F. Bates.

Fig. 159.—Gunshot fracture of the inferior maxilla. *Spec.* 1216, Sect. I, A. M. M.

Case.—Corporal Ebenezer Gallagher, Co. F, 52d Ohio Volunteers, aged 25 years, received a gunshot wound of the face, by a conoidal ball. He was admitted to the field hospital at Chattanooga, Tennessee, July 2d, 1864, and died July 4th, from secondary hæmorrhage. The case is reported by Assistant Surgeon C. C. Byrne, U. S. A.

Case.—Private *J. Greyer*, Co. K, 50th Georgia Regiment, received, June 1st, 1864, a gunshot fracture of the inferior maxilla. The ball entered at the left angle and escaped from the mouth. He was admitted to the Receiving and Wayside Hospital, Richmond. Secondary hæmorrhage occurred June 13th, which was controlled by persulphate of iron. The patient recovered.

Case.—Private Robert M. Gilson, Co. M, 6th Ohio Cavalry, aged 18 years, was wounded in the engagement at Hatcher's Run, Virginia, December 9th, 1864, by a conoidal ball, which perforated both jaws, near the angles. He was conveyed to the hospital of the cavalry corps, at City Point, Virginia, and on December 16th was admitted to the Armory Square Hospital, Washington. Secondary hæmorrhage took place, and patient died on the day of admission. Surgeon D. W. Bliss, U. S. V., reports the case.

Case.—Private Jared Goodrich, 19th New York Battery, aged 43 years, was wounded at Spottsylvania, Virginia, May 12th, 1864, by a conoidal ball, which fractured the lower jaw, right side. He was admitted to the Stanton Hospital, Washington, on the 20th. Simple dressings were applied, and tonics and stimulants administered. He died May 27th, 1864, from exhaustion and secondary hæmorrhage. The case is reported by Surgeon John A. Lidell, U. S. V.

Case.—Corporal John Heiser, Co. I, 53d Pennsylvania Volunteers, aged 27 years, received, at the battle of Deep Bottom, Virginia, August 14th, 1864, a gunshot wound of the face. Conoidal ball entered at superciliary ridge of right orbit, passing inwards, and emerged from neck, behind angle of inferior maxilla. When admitted to the Emory Hospital, Washington, on August 17th, 1864, he was feeble, and much exhausted from exposure on the field, and during transportation. On August 25th, bleeding profusely, chloroform and ether were administered, and the right common carotid artery, through an incision about two inches in length, was ligated by Surgeon N. R. Moseley, U. S. V. Cold water dressings were applied, and tonics and stimulants were administered. He died on August 30th, 1864, from exhaustion and constitutional irritability. The case is reported by the operator.

Case.—Private *J. H. Hancock*, Co. K, 30th Georgia Regiment, was wounded at the battle of Cold Harbor, Virginia, June 1st, 1864, by a conoidal ball, which entered over the second right lower molar tooth, passed downward and forward, cutting the end of the tongue and fracturing the inferior maxilla, at its symphysis, and emerged one-half inch below the angle of the mouth. He was conveyed to Receiving and Wayside Hospital, at Richmond, Virginia, the same day, where spicula of bone were removed on the following day. On June 8th and 10th capillary hæmorrhage occurred, which was controlled by the application of ice and persulphate of iron. On June 12th he was transferred. No further information can be obtained.

CASE.—Private R. Dayton Harvey, Co. K, 157th New York Volunteers, was wounded at the battle of Gettysburg, Pennsylvania, July 1, 1863, by a round ball, which entered in front of the left ear and passed out of the right cheek. He was conveyed to the Seminary Hospital the same day, and on July 11th was admitted to the McClellan Hospital, Philadelphia. Secondary hæmorrhage occurred on the 16th, which was arrested by means of persulphate of iron and pressure. He was discharged from service December 2d, 1863. There was total deafness in the left ear, and the mental functions were impaired. Surgeon Lewis Taylor, U. S. V., reports the case. The man was pensioned, but died October 31st, 1864, from inflammation of the brain.

CASE.—Private William M. Hersha, Co. K, 8th Michigan Volunteers, aged 20 years, was wounded at the battle of Cold Harbor, June 3d, 1864, by a conoidal ball, which fractured the inferior maxilla, right side. He was conveyed to the hospital of the 3d division, Ninth Corps, and transferred to Washington, and on the 9th admitted into Lincoln Hospital. On the 13th, he was transferred to York Hospital, Pennsylvania, where he was admitted on the 14th. Simple dressings were applied to the wound. Sloughing of the artery occurred June 28th, and secondary hæmorrhage followed, amounting to thirty-five ounces of blood, which all efforts failed to arrest. Patient died June 28th, 1864. The case is reported by Surgeon Henry Palmer, U. S. V.

CASE.—Sergeant L. D. Inskeep, Co. E, 122d Ohio Volunteers, aged 28 years, was wounded at the battle of Cold Harbor, June 3d, 1864, by a conoidal ball, which entered below the left eye, and passed out between the shoulders. He was on June 7th admitted to Lincoln Hospital, Washington. Secondary hæmorrhage occurred June 13th. Tonics and stimulants were administered. Patient died June 14th, 1864. The case is reported by Assistant Surgeon J. C. McKee, U. S. A.

CASE.—Private Samuel Jacoby, Co. C, 48th Indiana Volunteers, was wounded at the battle of Corinth, Mississippi, October 3d, 1862, by a gunshot missile, which entered the left cheek, passed through the inferior maxilla, and emerged above the clavicle, wounding the carotid artery. He was treated in the regimental hospital until October 13th, 1862, when he was admitted to the Mound City Hospital, Illinois. Secondary hæmorrhage occurred from the common carotid artery October 13th. The patient died October 13th, 1862. The autopsy showed that the cellular tissue about the wound of exit was infiltrated so as to form a firm fibrous ring about the orifice. The mouth was full of clotted blood, and there was an opening in the carotid, just below its bifurcation, one-half of an inch in length. The ball passed through the pharynx and the root of tongue. The case is reported by Surgeon E. C. Franklin, U. S. V.

CASE.—Private George W. Lundy, Co. F, 7th Michigan Cavalry, aged 25 years, received, at the battle of Gettysburg, July 3d, 1863, a pistol-shot wound. The missile entered the superior maxilla below the left eye and through the ala nasi muscle, passed close to the bifurcation of the carotid artery, under the meatus auditorius externus, and emerged a little behind and below the ear. He was on the same day conveyed to the field hospital, Seminary, Gettysburg. Secondary hæmorrhage occurred July 15th, which caused death immediately. On *post-mortem* examination, the ball was found to have passed in close proximity to the bifurcation of the carotid artery, contusing the coats, which caused inflammation and ulceration, and during a fit of coughing the artery ruptured at bifurcation, causing death. The case is reported by Surgeon Henry Janes, U. S. V.

CASE.—Private David Lozier, Co. K, 1st Maine Cavalry, aged 24 years, was wounded at the battle of South Side Railroad, March 31, 1865, by a fragment of shell, which fractured the inferior maxilla. He was on April 4th admitted to Judiciary Square Hospital, Washington. Secondary hæmorrhage from a branch of the left carotid artery occurred April 10th, amounting to ten ounces of blood. The patient died, before assistance could reach him. The case is reported by Surgeon E. Griswold, U. S. V.

CASE.—Private Alvin G. King, Co. B, 11th New Hampshire Volunteers, aged 32 years, was wounded at the battle before Petersburg, September 30th, 1864, by a conoidal ball, which entered above the arch of the zygoma, fracturing the superior maxilla, and cutting away a portion of the malar bones, all on the left side. He was on the same day conveyed to the hospital of the 2d division, Ninth Corps. On October 2d, he was admitted into the field hospital, Ninth Corps, and transferred to the 2d division hospital, Alexandria, where he was admitted October 12th. Cold water dressings were applied to the wound. Secondary hæmorrhage from a branch of the internal maxillary artery occurred October 19th, amounting to forty-eight ounces of blood. Styptics were applied, and stimulants and tonics administered. Hæmorrhage recurred every six hours. Patient died October 21st, 1864. The *post-mortem* examination revealed the ball embedded in the posterior nares. The case is reported by Surgeon Edwin Bentley, U. S. V.

CASE.—Private D. W. Kilburn, Co. I, 1st Maine Volunteers, aged 22 years, was wounded at the battle of Spottsylvania, Virginia, May 19th, 1864, by a conoidal ball, which entered angle of mouth, making its exit near posterior border of sterno-cleido-mastoideus muscle, wounding facial and external carotid arteries. He was admitted to the Finley Hospital, Washington, on May 28th, 1864. On May 29th, chloroform was administered, and the right carotid artery was ligated by Acting Assistant Surgeon J. C. Nelson. Severe hæmorrhage ensued after ligation. The patient continued to do well until the evening of June 1st, when he complained of severe pain in region of head and chest; also great dyspnœa. He died on June 2d, 1864, from asphyxia.

CASE.—Private John Lynn, Co. F, 37th Wisconsin Volunteers, aged 23 years, was wounded at the battle of South Side Railroad, April 2d, 1865, by a conoidal ball, which entered the body of the left malar bone, passed through the buccal cavity, and made its exit through the body of the inferior maxilla, near its right angle, comminuting both bones. He was conveyed by steamer to Washington, and admitted into Harewood Hospital April 5th. The treatment of the patient was rendered somewhat difficult from the fact that the passage of the ball through the buccal cavity had produced intense pharyngitis and œdema of the adjacent tissues, so that the food, though carefully selected, could only be with difficulty administered; while the particles of food and salivary secretions could only effectually be removed by syringing through both wounds of entrance and exit. Secondary hæmorrhage from the internal maxillary and facial arteries occurred April 9th, amounting to thirty ounces of blood. The sinking of the patient was so decided as to be beyond the control of any operative measures or medicinal treatment. The patient died April 9th, 1865. The *post-mortem* examination showed that the facial artery, at the point where it passes over the inferior maxilla, had been laid open. The case is reported by Surgeon R. B. Bontecou, U. S. V.

Case.—Private Charles G. Lincoln, Co. C, 22d Massachusetts Volunteers, received at the battle of Fredericksburg, Virginia, December 13th, 1862, a gunshot fracture of the superior maxillary. He was conveyed to the hospital of the 1st division, Fifth Corps, the same day, and on December 17th was admitted to the Eckington Hospital, Washington. Secondary hæmorrhage occurred, and the patient died on December 24th. Assistant Surgeon S. A. Storrow, U. S. A., reports the case.

Case.—Private Adam Myers, Co. C, 130th Pennsylvania Volunteers, aged 23 years, received at the battle of Antietam, September 17th, 1862, a gunshot comminuted fracture of the upper and lower jaws, and laceration of the lingual artery and its branches. He was conveyed to the hospital of the 3d division, Second Corps, and on September 20th, transferred to Harrisburg, Pennsylvania, where he was admitted into the Walnut Street Hospital. Stimulants and tonics were administered, and styptics applied to control the hæmorrhage. Pyæmia supervened September 24th. The condition of the patient was bad, and no apparent effect was produced by treatment. The patient died September 29th, 1862.

Case.—Sergeant George B. Merchant, Co. K, 4th Ohio Volunteers, aged 33 years, received at the battle of Spottsylvania, Virginia, May 10, 1864, a gunshot wound of neck, with fracture of inferior maxilla. He was admitted to Douglas Hospital, Washington, on May 13th, 1864. General health good. Secondary hæmorrhage occurred, to the amount of eighteen fluid ounces, probably from internal maxilla. On May 15th the right common carotid was ligated by Assistant Surgeon William Thomson, U. S. A. On May 30th, it was again ligated. On May 31st, ligature came away. He recovered, and was returned to duty on June 19th, 1864. The case is reported by the operator. The patient is a pensioner. Examiner L. M. Whiting reports, September 20th, 1864, that more than half of the ramus of the right side of the lower jaw is gone, and that there is very limited use of the right arm, owing to some injury during the ligation.

Case.—Private *J. Morris*, Co. I, 50th Georgia Regiment, was wounded at the battle of Cold Harbor, June 1st, 1864, by a conoided ball, which entered at the left angle of the inferior maxilla, and emerged from the mouth, producing extensive comminution of the inferior maxilla. He was admitted to the Receiving and Wayside Hospital, at Richmond, Virginia, the same day, where spicula of bone were removed by incision along the ramus of the jaw. The wound was closed by wire sutures. On June 13th, hæmorrhage occurred, which was controlled by the application of persulphate of iron. Food was given him through a tube up to the 14th, and on the 15th he was furloughed for sixty days. No further information can be obtained.

Case.—Private John B. McIlroy, Co. C, 45th Pennsylvania Volunteers, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal ball, which entered the upper lip, passed through cheek, fracturing the inferior maxilla, and injuring the internal maxillary artery, and made its exit at left ear; then entered the shoulder, fracturing the acromion process of the scapula. He was admitted to the Fairfax Seminary Hospital, near Alexandria, Virginia, on June 7th, 1864. His constitutional condition was good. Cold water dressings were applied. Hæmorrhage occurred, and on June 18th the common carotid artery, just above omo hyoid, was ligated by Acting Assistant Surgeon J. H. York. He died on June 19th, 1864, in consequence of hæmorrhage, caused by sloughing of posterior scapular artery, from second ball lodging upon it. The case is reported by Assistant Surgeon H. Allen, U. S. A.

Case.—Corporal Henry McDowell, Co. G, 60th New York Volunteers, aged 30 years, was wounded at the battle of Gettysburg, July 2d, 1863, by a piece of shell, carrying away the inferior maxilla. He was on the same day admitted to the field hospital, Twelfth Corps. Secondary hæmorrhage from the facial artery occurred July 13th, amounting to about twenty ounces of blood. Patient died July 16, 1863. The case is reported by Surgeon H. Ernest Goodman, U. S. V.

Case.—Private John L. Murray, Co. B, 42d New York Volunteers, aged 32 years, was wounded in the engagement at Bristow Station, Virginia, October 14th, 1863, by a conoidal ball, which entered posteriorly to right of spinous process of fifth cervical vertebra, passed anteriorly through middle third of inferior maxillary, producing compound fracture, and emerged opposite the canine teeth of same side; the injured parts were badly swollen and inflamed. He was admitted to the third division hospital, Alexandria, Virginia, on October 17th, 1863. On October 25th, chloroform was administered, and the common carotid artery, right side, was ligated, and a partial resection of the lower jaw performed by Surgeon Edwin Bentley, U. S. V. The ligatures came away November 11th, 1863. He was discharged from the service on February 13th, 1864. The case is reported by the operator. His name does not appear on the pension list.

Case.—Private Samuel McInnis, Co. A, 11th Illinois Volunteers, aged 27 years, was wounded at the battle of Vicksburg, Mississippi, May 22d, 1863, by a musket ball, which entered immediately above and posterior to angle of left jaw, passed through pharynx and posterior nares, and made its exit at angle (right) of lower jaw, fracturing the bone. He was admitted to the Jackson Hospital, Memphis, Tennessee, on May 27th, 1863; wound suppurating, profuse hæmorrhage from external carotid and branches. On May 31st, the common carotid artery was ligated by Surgeon E. M. Powers, 7th Missouri Volunteers. Great general depression of system; pulse feeble and frequent; considerable febrile excitement and restlessness. Stimulants, nutritions diet, and opiates were administered. No unpleasant symptoms after operation. On June 5th, 1863, patient was doing well. He died on June 7th, 1863. The case is reported by the operator.

Case.—Sergeant Francis Maas, Co. E, 6th Kentucky Volunteers, aged 40 years, was wounded at the battle of Resaca, Georgia, May 15th, 1864, by a conoidal musket ball, which entered the mouth, fracturing the inferior maxilla, and emerged through the neck. On May 21st, he was conveyed to the field hospital at Bridgeport, Alabama. Secondary hæmorrhage occurred, on the following day, from the inferior maxilla or some of its ramifications, amounting to eighteen ounces, which was arrested by the application of ice. Simple dressings were applied, and the wound healed kindly. He was furloughed July 9th On August 8th, he was admitted to the Crittenden Hospital, Louisville, Kentucky, and is charged with desertion December 31st, 1864. He is a pensioner. Assistant Surgeon H. T. Legler, U. S. V., reports the case.

Case.—Private Patrick McCormick, Co. A, 4th New York Volunteers, was wounded at the battle of Antietam, Maryland, September 17th, 1862, by a conoidal ball, which entered the face, fracturing the upper jaw, passed backward and downward

through the neck, wounding the carotid artery. He was conveyed to the hospital of the Third Corps, and, on September 22d, was admitted to No. 5 Hospital, Frederick, Maryland. September 24th, abscess opened over the thyroid cartilage, and bone extracted. The opening from abscess communicates from above with the mouth, a sinus leading downward toward sternum. He died September 29th, from secondary hæmorrhage from the carotid artery. Autopsy: the missile entered the mouth opposite symphisis of lower jaw, right side, injuring the tongue and soft parts, comminuting the bone up to its ramus, and producing a dislocation outward, and lodged in the inferior triangle of the neck, grazing the common carotid, one inch from its bifurcation. Secondary hæmorrhage was from the ulceration of the artery. The jaw was divided at its symphisis. The whole inner surface of sterno-mastoid was dissected. Surgeon H. S. Hewitt, U. S. V., reports the case.

Case.—Private A. Mooney, Co. H, 1st New York Artillery, aged 34 years, was wounded May 29th, 1862, by a musket ball. The missile entered the left cheek, fractured the malar bone, and passing backward, emerged parallel to and one inch behind the mastoid process of the left temporal bone. He was, on June 3d, 1862, admitted to the hospital at Annapolis, Maryland. June 5th, successive secondary hæmorrhages from the internal maxillary artery. On the 9th, lost from six to eight ounces of blood, which was arrested by the application of ice and injections of the solution of persulphate of iron. On the 16th, he had slight hæmorrhage. Patient died comatose June 27th, 1862. The case is reported by Surgeon Thomas A. McParlin, U. S. A.

Case.—Private William H. McL———, Co. A, 108th New York Volunteers, aged 21 years, was wounded at the battle of Antietam, September 17th, 1862, by a musket ball, which fractured the ramus of the inferior maxilla, left side. The missile entered below the mastoid process of the right temporal bone, passed upward and forward, traversing the parotid gland, and carried away the condyle and a part of the ascending ramus of the lower maxilla, and lodged in the zygomatic fossa, severing in its course the temporal and the internal maxillary branches of the carotid artery. He was, on September 26th, admitted to Carver Hospital, Washington. On October 15th, excessive hæmorrhage occurred, to the amount of thirty ounces, from the temporal and the branches of the internal maxillary arteries, which was controlled by compression. Hæmorrhage recurred on the 21st and 22d. Patient died October 24th, 1862. The pathological specimen is No. 632, Sect. I, A. M. M. The case is reported by Surgeon O. A. Judson, U. S. V.

Case.—Corporal Charles Morrow, Co. I, 4th New Jersey Volunteers, received, at the battle of Fredericksburg, Virginia, December 13th, 1862, a gunshot fracture of the inferior maxilla, right side. He was conveyed to the hospital of the 1st division, Sixth Corps, and, on December 19th, was sent to the 2d division hospital, Alexandria, Virginia. Hæmorrhage from the facial artery, which occurred at various times, was controlled by compression and lint saturated with persulphate of iron. He was discharged from the service on February 23d, 1863. He is a pensioner, his disability being rated three-fourths and permanent. The case is reported by H. W. Sawtelle, M. D.

Case.—1st Lieutenant Thomas E. Maley, 5th United States Cavalry, aged 29 years, was wounded at the engagement at Deep Bottom, Virginia, July 28th, 1864. An explosive ball entered the face beneath the right zygoma, and passing through, exploded in the left antrum of Highmore. He was admitted to the Ladies' Home Hospital, New York City, on August 1st, 1864. Secondary hæmorrhages occurred on August 18th, 22d, 23d, and 24th. He was prostrated from loss of blood. Pulse 105 and feeble. On August 24th, the right common carotid artery was ligated by Surgeon Alexander B. Mott, U. S. V. August 30th, patient doing well under generous diet and tonics; pulse 84. On September 10th, ligature came away. No recurrence of hæmorrhage. He was granted leave of absence on October 4th, 1864, and was dropped from the rolls while on leave. On July 28th, 1868, Lieutenant Maley called on Assistant Surgeon George A. Otis, U. S. A., in reference to a plastic operation. He is not a pensioner. The case is reported by the operator.

Case.—Private Joseph D. Norcross, Co. I, 9th Maine Volunteers, aged 40 years, was wounded at the battle before Petersburg, July 30th, 1864, by a conoidal ball, which passed through the superior maxilla. He was, on August 2d, admitted to Fort Monroe Hospital. Simple dressings were applied to the wound. On August 6th, he was transferred to New York, where he was admitted into the DeCamp Hospital, David's Island. Secondary hæmorrhage from the jugular vein occurred August 14th, amounting to forty ounces of blood. Stimulants and tonics were administered. Patient died August 15th, 1864. The case is reported by Assistant Surgeon Warren Webster, U. S. A.

Case.—Private P. O'Connor, Co. F, 61st New York Volunteers, received, at the battle of Fair Oaks, June 1st, 1862, a a gunshot wound of the œsophagus and a fracture of the ramus of the lower jaw, on the left side. He was, on June 8th, admitted to the South Street Hospital, Philadelphia. The wound of the neck had already healed. Repeated attempts at apposition of fractured portions of the jaw were made by means of pasteboard splints and Barton's bandages. The patient was suffering with profuse salivation, which was attended with great thirst and a constantly increasing difficulty of deglutition. The dressings interfered with his efforts to quench his thirst, and were removed by him at the first opportunity after their application. As the throat symptoms became more and more prominent, all treatment of the fractured jaw was abandoned. Secondary hæmorrhage occurred June 12th, from the arteries of the throat, which was checked by a solution of persulphate of iron. Successive hæmorrhages. Inability to swallow. Milk punch freely administered per rectum. Patient died of exhaustion June 15th, 1862. *Post mortem* showed that the ball entered on the right side of the neck, at the posterior border of the sterno-cleido-mastoid muscle, and passed behind the larynx and laid open the œsophagus, then turning at a right angle, penetrated the floor of the mouth, and passed out a little to the left of the mental symphysis, producing a fracture of the ramus of the lower jaw, on the left side.

Case.—Private Albert W. Perry, Co. C, 1st Vermont Artillery, aged 24 years, was wounded at the battle of Cold Harbor, June 1st, 1864, by a conoidal ball, which fractured the facial bones. He was conveyed to the hospital of the 2d division, Sixth Corps, and transferred by steamer from White House Landing to New York, where, on the 15th, he was admitted to DeCamp Hospital, David's Island. Simple dressings were applied to the wound. Secondary hæmorrhage from the superior maxillary artery occurred June 18th, and recurred on the 20th, amounting to sixty-four ounces of blood. Patient died June 21st, 1864. The case is reported by Assistant Surgeon Warren Webster, U. S. A.

CASE.—Corporal John H. P———, Co. H, 19th Maine Volunteers, aged 31 years, was wounded at the battle of Spottsylvania, May 12th, 1864, by a conoidal ball, which entered the mouth, producing a comminuted fracture of the alveolar process of the superior and fracture of the inferior maxilla; also lacerating deeply the right border of the tongue to the extent of two inches. He was on May 21st admitted to Finley Hospital, Washington. Simple dressings were applied to the wound. Secondary hæmorrhage from the internal carotid artery occurred May 28th, amounting to two pints of blood. Patient died May 29th, 1864. The specimen is No. 207, Sect. I, A. M. M. The case is reported by Surgeon G. L. Pancoast, U. S. V.

CASE.—Corporal Isaac W. Patterson, Co. E, 19th Maine Volunteers, aged 19 years, was wounded at the battle of Spottsylvania, Virginia, May 10th, 1864, by a conoidal ball, which fractured the inferior maxilla and wounded the facial artery. He was conveyed to the hospital of the 2d division, Second Corps, and on May 16th he was admitted to the Lincoln Hospital, Washington. Secondary hæmorrhage occurred, which was controlled by compression and persulphate of iron. He died May 21st, 1864. Assistant Surgeon J. Cooper McKee, U. S. A., reports the case.

CASE.—Private *William Prater*, Co. B, 48th Virginia Regiment, aged 23 years, was wounded February 6th, 1865, by a conoidal ball, which struck the middle of the right cheek, passed through the right ramus of the inferior maxilla, and ploughing through the tongue, fractured the left ramus at its angle; it then glanced, and emerged from under the left mastoid process. He was admitted to the Chimborazo Hospital No 1, Richmond, Virginia. On February 13th, secondary hæmorrhage occurred from the lingual artery, at the root of the tongue, which was arrested by styptics.

CASE.—Sergeant Philip C. Quick, Co. H, 141st Pennsylvania Volunteers, aged 26 years, was wounded at the battle of Spottsylvania, May 12th, 1864, by a conoidal ball, which caused a compound fracture of the inferior maxilla, right side. He was on May 16th admitted to Lincoln Hospital, Washington. Secondary hæmorrhage from the sublingual and the superior thyroid artery of the left side occurred May 18th, and recurred on the 19th, amounting to about sixty ounces of blood. In consequence of the laceration of the muscular structure, it was impossible to ligate in the wound; and after the hæmorrhage occurred, the patient was too much debilitated to admit of ligating the carotid artery, which was the only alternative. As he opened his mouth with great difficulty, enemas of beef tea and brandy were administered every three or four hours. Lint, saturated with a solution of chloride of iron, was constantly applied to the wound. He died May 19th, 1864. The case is reported by Assistant Surgeon J. C. McKee, U. S. A.

CASE.—Private Erastus Ranger, Co. E, 32d Maine Volunteers, aged 26 years, was wounded at the battle of Petersburg, Virginia, July 6th, 1864, by a conoidal ball, which entered one and a half inches below the angle of the lower jaw, left side, passed obliquely across the neck, and emerged two inches to the right of the symphysis, comminuting the bone in its course, and injuring the thyroid cartilage. He was conveyed to the hospital of the 2d division, Ninth Corps, where several fragments of bone were removed, and on the 16th admitted to Mower Hospital, Philadelphia. Simple dressings were applied. On July 19th, hæmorrhage occurred, supposed to come from the lungs. On July 21st, profuse hæmorrhage took place from the mouth, nose, and both wounds, and death resulted on the same day. *Post-mortem* examination revealed the inferior thyroid and lingual arteries severed by the ball. Surgeon Joseph Hopkinson, U. S. V., reports the case.

CASE.—Private William Reeves, Co. C, 76th New York Volunteers, aged 22 years, received, at the battle of the Wilderness, Virginia, May 6th, 1864, a compound comminuted fracture of inferior maxilla by a conoidal ball, which entered the left cheek half an inch anterior to the angle of the jaw, and emerged at a point nearly opposite. He was conveyed to a field hospital, where a large number of splinters were removed through the mouth and aperture of exit. He was admitted to the Stanton Hospital, Washington, on May 11th, 1864. Aperture of entrance small; that of exit about three inches in its longest diameter. On May 12th, secondary hæmorrhage occurred. He lost about twenty-four ounces of blood, and was much exhausted. On the same day, at five o'clock P. M., the left common carotid artery was ligated by Assistant Surgeon George A. Mursick, U. S. V. No anæsthetic was used. Patient did not rally after the operation. He died on May 13th, 1864, at four o'clock A. M., from exhaustion. The autopsy showed the hæmorrhage to have occurred from the lingual and inferior dental arteries. The case is reported by the operator.

CASE.—Private John R———, Co. B, 63d New York Volunteers, aged 30 years, was wounded at the battle of the Wilderness, May 5th, 1864, by a conoidal ball, which fractured the inferior maxilla and divided the carotid artery, and lodged behind the tonsil. He was, on May 13th, admitted to Finley Hospital, Washington. Successive hæmorrhages from the internal wound in the fauces occurred May 14th, amounting to one pint of blood. Cold water dressings were applied to the wound. On May 31st, fragments of bone were removed, and the common carotid artery was ligated below the right omo-hyoid muscle by Surgeon G. L. Pancoast, U. S. V. The patient died June 1st, 1864, from secondary hæmorrhage. Specimens of the common carotid artery and inferior maxilla were contributed to the museum by the operator, and are Nos. 2481 and 2482.

FIG. 160.—Right ramus of lower jaw fractured by a musket ball. *Spec.* 2482, Sect. I, A. M. M.

CASE.—Private Lemuel Record, Co. A, 7th Indiana Volunteers, aged 24 years, was wounded at the battle of the Wilderness, May 9th, 1864, by a conoidal ball, which entered the nostril, right side, and passed out at the neck, fracturing the lower jaw. He was on the same day conveyed to the hospital of the 4th division, Fifth Corps, and transferred to Alexandria on May 12th, where he was admitted into the 2d division hospital on the 14th. Simple dressings were applied to the wound. Secondary hæmorrhage from the transverse facial artery occurred May 30th, and recurred on the 31st, amounting to twelve ounces of blood. Styptics were applied. Patient died June 2d, 1864. The case is reported by Surgeon Edwin Bentley, U. S. V.

CASE.—Corporal *Robert V. Ricks*, Co. E, 55th North Carolina Regiment, aged 25 years, was wounded at the battle of Spottsylvania, May 10th, 1864, by a conoidal ball, which fractured the superior and inferior maxilla. He was on May 12th

admitted to the 2d division hospital, Alexandria. Secondary hæmorrhage from a branch of the carotid artery occurred May 12th, amounting to fourteen ounces of blood, which was controlled by the application of persulphate of iron. On June 1st, he was transferred to Lincoln Hospital, Washington, whence he was sent to the Old Capitol Prison, as a prisoner of war, June 29th, 1864. The case is reported by Surgeon E. Bentley, U. S. V.

Case.—Private John A. Schott, Co. C, 98th Pennsylvania Volunteers, aged 24 years, was wounded at the battle of Fredericksburg, May 3d, 1863, by a conoidal ball, which entered the left side of the face, about one inch below the eye, and passed inward and backward, entering the mouth, fracturing the hard palate and inferior maxilla, and totally destroying sight of left eye; then passed out again to the right side of the neck, and lodged superficially about one inch and one-half below the right ear. He was on May 7th admitted to Campbell Hospital, Washington, and transferred to Philadelphia, where, on June 28th, he was admitted into the Turners' Lane Hospital. Simple dressings and flax-seed poultices were applied to the wound. On June 30th, there was much pain in the right superior posterior triangle of the neck, which was very much inflamed, and discharging freely from an opening in that region. On July 2d, the ball, with adherent piece of bone about one inch in length, supposed to be a portion of the inferior maxilla, was removed, suppuration and ulceration having taken place around it. Slight hæmorrhage followed the removal of the ball. On December 12th, the wound had entirely healed, and the patient's health was good, though there was much chronic enlargement of the right side of the face. He was transferred to the 2d batallion, Invalid Corps, November 4th, 1863. Shott is a pensioner. He is very much disfigured. His disability is rated total. Pension Examiner Thomas B. Reed reports that he has to use an obturator to enable him to speak distinctly. A cast of the head, showing deformity, and the missile, a conoidal ball much battered and increased longitudinally by compression, with a spiculæ of bone lodged in it, are in the collection of the Army Medical Museum, and are numbered 1554 and 4518, Sect. I. The case is reported by Acting Assistant Surgeon David Burpee, who contributed the ball represented in the wood-cut (Fig. 160), and the cast of the deformed face was contributed by Acting Assistant Surgeons C. Carter and C. B. King.

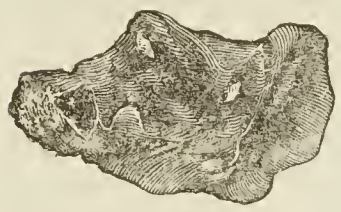

Fig. 161.—Ball, with impacted bone, probably from the lower maxilla. *Spec.* 4518, Sect. I, A. M. M.

Case.—Corporal Asa D. Smith, Co. D, 16th Massachusetts Volunteers, was admitted into hospital at the Naval Academy, Annapolis, Maryland, June 4th, 1862, with a compound fracture of the lower jaw. The treatment consisted of the removal of that portion of the jaw lying between the molars of the opposite sides. Secondary hæmorrhage, which was arrested by the application of ice, occurred July 12th. He recovered, and was discharged from the service July 27th, 1862, with very little disfiguration. The case was reported by the operator, Acting Assistant Surgeon B. B. Miles. He is a pensioner. On September 26th, 1866, Pension Examiner George S. Jones reports that the bone is re-united, but the pensioner is unable to masticate solid food. His disability is rated total and permanent.

Case.—Sergeant John Starkey, Co. F, 6th New Hampshire Volunteers, was wounded at the second battle of Bull Run, Virginia, August 30th, 1862, by a conoidal ball, which entered the upper lip and emerged just behind the ear, right side, causing a compound comminuted fracture of the superior maxillary and malar bones of that side. A portion of the upper jaw was removed on the field by Assistant Surgeon Benjamin Howard, U. S. A. He was admitted into the Unitarian Church Hospital, at Washington, September 7th, 1862, at which time there was erysipelas of the whole right side of the face, and of the right eye, with severe pain. Simple dressings were applied to the wounds, and as he could not use any solid food, beef-tea and chicken-broth, combined with a milk diet, was ordered. He stated that several pieces of bone had been removed in the field hospital. On September 15th, the wounds were unhealthy, the discharges ichorous. The swelling of the face was disappearing He lost the sight of the right eye by retinitis. On the 13th, hæmorrhage, which recurred several times, took place from the wound of exit. The amount of blood lost at each time was small, owing to the immediate application of persulphate of iron and compress. No lacerated artery could be discovered upon examination. He was very weak and reduced when the hæmorrhage occurred. He died on September 22d, 1862. There was no autopsy, but the base of the brain was believed to be affected. The case is reported by Acting Assistant Surgeon A. A. Buck.

Case.—Corporal Amos G. Schofield, Co. F, 1st Minnesota Volunteers, was wounded at the battle of Bull Run, Virginia, July 21st, 1861, by a conoidal ball, which entered two inches behind the left mastoid process, and escaped at the mouth, fracturing the lower maxilla, and carrying away a portion of the primative carotid and its branches from the left side. He was admitted to the 3d division hospital, Alexandria, the next day; an aneurismal tumor had formed. The case did well, except that there was a hard circumscribed swelling beneath the left ear. On August 4th, a hæmorrhage occurred from the wound of entrance, which was controlled by a graduated compress, but which was gradually succeeded by a swelling which extended from the mastoid process to the clavicle, and which was caused by the escape of blood into the tissues of the neck. Frequent hæmorrhages occurred from the wound in the mouth, which could not be controlled but by compression on the left carotid. The compression on the veins of the neck induced great œdematous swelling of the face, the left eye was closed, the tongue hung from the open mouth, and articulation became impossible. The hæmorrhage from the mouth having returned about 5 A. M., on August 11th, compression was made over the carotid, when the patient appeared to have drawn into his glottis a clot of blood, during an effort at inspiration. Apnœa ensued, followed in a few moments by death, his strength being entirely exhausted by his losses of blood and rest, and his continued suffering. At the autopsy the left side of the neck was found distended by effused blood. The internal carotid was uninjured, but the external was lost in the tumor, which seemed to be a true aneurism undergoing consolidation. Behind the pharynx was found a quantity of dark fluid blood. In the right ventricle of the larynx was found a soft clot, which was the immediate cause of death, since it acted as a valve permitting of expiration, but preventing inspiration. Assistant Surgeon H. Lawrence Sheldon, U. S. A., decided against an operation, as he could not satisfy his mind as to the source of the hæmorrhage. The pathological specimens, consisting of a part of the lower jaw and a portion of the primitive carotid and its branches exhibiting a tumor, were contributed to the Army Medical Museum, with a history of the case, by Assistant Surgeon William Thompson, U. S. A., and are numbered 4923 and 4925 of the Surgical Section.

CASE.—Private Samuel Stienberger, 1st United States Cavalry, was wounded at the battle of Williamsburg, Virginia, May 5th, 1862, by a musket ball, which entered to the left of the symphysis of lower jaw, fractured the bone and carried away several teeth, a part of the tongue, and posterior wall of pharynx. He was unable to swallow nourishment, without the greatest distress and difficulty. Swelling of injured parts; copious hæmorrhage. He was admitted to the Hygeia Hospital, Fort Monroe, Virginia, on May 9th, 1862. On May 13th, removal of ball and several teeth from abscess above clavicle. May 16th, copious hæmorrhage from wound. Sulphuric ether was administered, and the common carotid artery was ligated by Surgeon Reed B. Bontecou, U. S. V. Seven days after ligation, hæmorrhage from wound from which ball was extracted; an unsuccessful attempt was made to find the bleeding point. He died on May 23d, 1862, from exhaustion from hæmorrhage. Autopsy indicated that the ball had fractured the transverse process of the third cervical vertebra. The vertebral artery had worn against the spicula thus produced, and hence the second hæmorrhage. The case is reported by the operator.

CASE.—Private George W. Scales, Co. B, 54th Indiana Volunteers, was wounded at the battle of Vicksburg, Mississippi, December 29th, 1862. The missile entered the mouth, knocking in the front teeth of the upper and lower jaw, and lodging in the neck below and behind the mastoid process. He was conveyed to the hospital of the 3d division, Thirteenth Corps, where he remained until January 8th, 1863, when he was taken on board the hospital transport City of Memphis. On January 9th, secondary hæmorrhage occurred, which was arrested by the application of persulphate of iron. On January 13th, he was admitted to hospital at Paducah, Kentucky, and discharged from service July 5th, 1863, for aneurism of the left external carotid artery. The case is reported by Surgeon H. P. Stearns, U. S. V. On May 19th, 1868, Pension Examiner W. A. Clapp reports that mastication is difficult, as well as deglutition, from injury to tongue. He rates his disability total and permanent.

CASE.—Captain Jacob Schwartzlander, Co. D, 104th Pennsylvania Volunteers, aged 32 years, was wounded at the battle of Fair Oaks, Virginia, May 31st, 1862, by a conoidal ball, which entered the inferior maxilla, right side, in front of its angle, passed through the tongue about one inch behind its apex, and emerged through the inferior maxilla of left side, higher up and somewhat back of the wound of entrance, fracturing it. In its course, it shattered the jaw at point of entrance, removed several lower and one upper molar tooth, and lacerated the tongue so that the anterior part protruded from the mouth. The ball evidently struck with its side, its axis parallel to the cheek, and turned, in its course, so as to make its exit with its apex forward. The wounds, which bled profusely, were dressed with lint and adhesive strips. He became weak from loss of blood, and was conveyed to Savage Station, where the wound was redressed. There was some hæmorrhage during the night, but not much pain, and the tongue so much swollen as to protrude from the mouth and prevent deglutition. He was conveyed to the hospital transport W. Whillidin, for transfer to Philadelphia. On June 1st, several spiculæ of bone and some teeth were removed, the tongue was replaced so far as tumefaction would allow, the fracture adjusted and pasteboard splint and bandage applied. He was unable to take nourishment until June 2d, when beef tea was administered by a tube through the nostrils. He was admitted to St. Joseph's Hospital at Philadelphia, June 4th, at which time he could not articulate, deglutition was still difficult, the wounds were suppurating freely, the tongue was sloughing, the discharge being very fetid, and the general strength much reduced. Several spiculæ of bone were extracted, and the lacerated and protruding tongue was removed by ligature, which came away in three weeks. He was fed for eight weeks through a tube, the mouth and fauces were syringed with water every two hours, and external applications of a solution of sulphate of copper were made. About August 24th, he was able to articulate distinctly. The tongue was gradually filling up. He was able to eat every kind of food. The deformity of jaw was disappearing, and there was great mobility. He was returned to duty. Not a pensioner.

CASE.—Private Anthony Surbe, Co. C, 6th Iowa Volunteers, aged 22 years, was wounded at the battle of Dallas, Georgia, May 26th, 1864, by a conoidal ball, which fractured the lower jaw, and escaped near the left angle of the mouth. He was admitted to the hospital of the 4th division, Fifteenth Corps, thence conveyed to the field hospital, Chattanooga, Tennessee, where he was admitted on June 4th. Tonics, stimulants and nourishing diet ordered. Secondary hæmorrhage from the right external carotid artery occurred June 5th; loss of blood, one pint. Hæmorrhage recurred on the 7th, the loss of blood amounting to three quarts. Patient died June 7th, 1864. The case is reported by Assistant Surgeon C. C. Byrne, U. S. A.

CASE.—Private William Wolf, Co. K, 7th New York Heavy Artillery, aged 30 years, was wounded at the battle of Petersburg, April 7th, 1865, by a conoidal ball, which entered the lower jaw, near the right angle, passing directly through, producing a compound comminuted fracture of the inferior maxilla, and lacerating almost from ear to ear. He was on April 15th admitted to 1st division hospital, Annapolis, Maryland. On admission the patient was feeble and anæmic, having from time to time lost considerable blood; the wound was looking badly and very offensive; the jaw was very much shattered, many of the fragments being imbedded in the cheek, others hanging loosely through the opening below the chin; every tooth was carried away, and altogether the wound was frightful. The power of utterance was gone, and it was with difficulty he could swallow, most of the food passing through the opening below. He improved up to the 23d, when secondary hæmorrhage from the sub-maxillary, probably the facial artery, occurred April 23d, and recurred on the 27th, amounting to twenty-four ounces of blood, which was controlled by pressure upon the right carotid artery and the application of tincture of muriate of iron. After the hæmorrhage on the 27th, his case became hopeless. The patient died April 30th, 1865. The case is reported by Surgeon B. A. Vanderkieft, U. S. V.

CASE.—Quartermaster Sergeant Amos Whitney, Co. C, 5th New York Heavy Artillery, aged 39 years, was wounded at Snicker's Gap, July 18th, 1864, by a conoidal ball, which produced a transverse fracture of the lower maxilla. He was, on July 22d, admitted to Sandy Hook Hospital, Maryland, and transferred on the 27th to Frederick City Hospital, where he was admitted the same day. Simple dressings were applied to the wound. Secondary hæmorrhage from the facial artery occurred July 31st, amounting to sixty-four ounces of blood. Patient died July 31st, 1864. The case is reported by Assistant Surgeon R. F. Wier, U. S. A.

CASE.—Lieutenant Thomas Westcott, Co. K, 8th New York Heavy Artillery, aged 23 years, was wounded at the battle of Cold Harbor, June 1st, 1864, by a conoidal ball, which fractured the left superior maxilla. The missile entered the left side

of the nasal cavity, passed through the levator muscle, and lodged in the sterno-cleido-mastoid muscle. He was conveyed to the hospital of the 2d division, Second Corps. On the 4th, he was admitted to Seminary Hospital, Georgetown, where Acting Assistant Surgeon J. M. McCalla administered chloroform and extracted the ball from the left side of the trapezius muscle. Cold water dressings and flax-seed poultices were applied to the wound. The appetite was poor, and the patient suffered much from loss of sleep. On the 25th, he was transferred to Baltimore, and admitted into the Newton University Hospital. Secondary hæmorrhage from the internal maxillary artery occurred June 29th, and recurred the same day and on the 30th, amounting to fourteen ounces of blood, which was controlled by pressure. On September 24th, he was transferred to Annapolis, where he was admitted into the 1st division hospital. He was discharged the service October 16th, 1864. The case is reported by Surgeon E. McDonnell, U. S. V. He is a pensioner; his disability is rated total and probably permanent.

Case.—Private *George T. A———*, Co. E, 3d North Carolina Infantry, was wounded at the battle of Gettysburg, July 3d, 1863, by a conoidal musket ball, which fractured the right lower jaw. He also received a wound of the neck. He was taken prisoner and treated in field hospital until July 10th, 1863, when he was admitted to the Newton University Hospital, Baltimore, Maryland, where fragments of bone were removed from the body of the right lower jaw, halfway between chin and angle, and the parts coaptated. Barton's bandage was applied, with cold water dressings. Mild saline cathartics were given, and nourishing liquid diet prescribed. He improved rapidly, and on July 16th was transferred to the Chester Hospital, Pennsylvania, whence he was transferred, on September 17th, to City Point, Virginia, for exchange. He was afterward admitted to Hospital No. 1, Richmond, Virginia, and, on September 25th, 1863, furloughed for forty days. The pathological specimen, consisting of three fragments of bone and a molar tooth, was contributed to the Army Medical Museum by Surgeon C. W. Jones, U. S. V., and is numbered 1691 of the Surgical Section.

Case.—Private *Henry C. B———*, Co., F, 30th North Carolina Infantry, received a gunshot wound of the face at the battle of Antietam, September 17th, 1862, the entire lower jaw being shot away to points within one inch and a half of the angles. He was admitted, on October 18th, to Hospital No. 5, Frederick, where death resulted, on December 17th, 1862, from exhaustion and inanition. The pathological specimen consists of the inferior maxilla. An irregular plate of new bone measuring two inches in length, three-fourths of an inch in width, and half an inch in thickness, has formed anteriorly, and is connected to the rami on either side by ligamentous bands. It was contributed to the Army Medical Museum by Surgeon H. S. Hewit, U. S. V., and is numbered 1162 of the Surgical Section.

Case.—Private John Baker, Co. I, 9th Pennsylvania Reserves, aged 19 years, was wounded at the battle of Charles City Cross Roads, Virginia, June 30th, 1862, by a conoidal ball, which entered at the left angle of the mouth, fractured the upper jaw, cut the tongue half in two, and emerged at the angle of the right lower jaw, fracturing it and displacing the teeth. He received also a bayonet wound in the lower part of the back, which penetrated the left thigh. He was admitted into the Satterlee Hospital, Philadelphia, on July 26th, 1862. On the same day, Acting Assistant Surgeon Edward A. Smith removed several pieces of loose bone. Cold water dressings were applied, and the jaw was kept closed. Fluid diet was ordered. As the bone became loosened it was removed from the inside until almost the entire right side of the inferior maxilla became detached. Then the outer wound healed, the jaw became gradually stiffened until February 3d, 1863, at which time he was able to chew food of some consistence, and suffered but little. He had neuralgic pains at times, and some deterioration of the facial angle; his health was good. He was discharged the service on April 14th, 1863. The case is reported by the operator. On November 17th, 1869, Pension Examiner S. Logan reports that Baker's leg is paralyzed and atrophied, resulting from the bayonet wound, and that his disability is permanent.

Case.—Second Lieutenant Nelson Crockett, Co. A, 55th Ohio Volunteers, aged 37 years, was wounded at the second battle of Bull Run, August 30th, 1862, by a conoidal ball, which entered the left side of the inferior maxilla, two inches from the angle, fracturing it at this point, then passed across beneath the tongue and emerged on the right side from the inferior maxilla, fracturing this also at a point one inch and a half from the symphysis. He was conveyed to Alexandria, Virginia, and admitted into the 3d division hospital on August 31st, 1862. The fractured portions of the bone were secured at the two extremities by silver wire, and Barton's apparatus was applied. The patient was discharged the service on April 4th, 1863, the union of the bone being imperfect. The case is reported by Surgeon Edwin Bentley, U. S. V. On April 5th, 1868, Pension Examiner H. Frasse reports "the fracture is ununited, interfering with the patient's speech, and disables him from masticating solid food." He rates his disability total and permanent.

Case.—Private Michael Donhouser, Co. H, 10th United States Infantry, aged 25 years, was wounded at Gettysburg, July 3d, 1863, by a conoidal musket ball, which fractured both rami of the inferior maxilla at the angles. Several teeth were carried away and the tongue injured. The hæmorrhage was severe. He was treated in field hospital until September 26th, 1863, when he was transferred to St. Joseph's Hospital, Central Park, New York. On admission, the jaw was imperfectly united by fibrinous exudations on both sides. Articulation was destroyed. On October 1st, a small spiculum of bone was removed, internally, from the left side of the jaw. By November 19th, the wound having healed, he was transferred to the post hospital at Fort Columbus, New York Harbor, whence he was discharged on December 16th, 1863, on account of complete aphonia from injury to the tongue. He is not a pensioner.

Case.—Lieutenant William E———, 17th United States Infantry, was wounded at the battle of Gettysburg, July 2d, 1863, by a conoidal ball, which entered the left side of the face, shattering the body of the inferior maxilla, and emerged beneath the ramus of right side. He was, on the next day, admitted to the Seminary Hospital, Gettysburg, and on July 8th, transferred to Newton University Hospital, Baltimore. On admission, he was much enfeebled, and the wound was in very bad condition. Surgeon C. W. Jones, U. S. V., at once removed the fractured portions of bone and two molar teeth from left side of body of the inferior maxilla, syringed the wound, cleaned the mouth with tincture of myrrh, applied a dressing of lint saturated with a solution of chlorinated soda, and secured the jaw by Barton's bandage. Stimulants and nourishing diet were given. Under this treatment the patient reacted rapidly, and continued to improve steadily. In thirty-six hours he could converse intelligibly;

subsequently yeast and charcoal poultices were applied to the wound, which left it clean, with healthy granulations, and he was granted a leave of absence on July 14th, 1863. On January 23d, 1864, he was admitted to the 1st division hospital at Annapolis; the wounds had closed with but slight deformity; the tongue was partially paralyzed. He was returned to duty on February 6th, 1864. The pathological specimen, consisting of nine small fragments of bone and two molar teeth, was contributed to the Army Medical Museum by the operator, and is numbered 1689 of the Surgical Section. A fang of one of the teeth is broken off and remains in the socket, which forms part of the largest fragment. The fragments correspond to about one inch of the body of the bone. He is not a pensioner.

Case.—Private Patrick Gibney, Co. B, 31st New York Volunteers, aged 19 years, received a gunshot wound of the face at Chancellorsville, Virginia, on May 3d, 1863, the missile entering at right alæ nasi and emerging near the right angle of the lower jaw, which it fractured. He was treated in field hospital until May 9th, when he was admitted to Harewood Hospital, Washington. Simple dressings were applied to the wound, and the fractured parts kept in position. He recovered, and was discharged on May 25th, 1863, his term of service having expired. He is not a pensioner.

Case.—Private Robert Goldsmith, Co. A, 107th New York Volunteers, aged 23 years, was wounded at Antietam, September 17th, 1862, by a conoidal ball, which entered in front of the symphysis of the right inferior maxilla, passed obliquely backward beneath the tongue, then downward and backward, and lodged in the scapula just above its spine, fracturing the maxilla at the symphysis and the angle. The ball was cut out on the field. Considerable hæmorrhage followed immediately after the injury, with complete paralysis of the right arm. He was conveyed to Philadelphia, and admitted into the Broad and Cherry Streets Hospital on September 26th, 1862, when his arm was still paralysed, the tissues around the jaw swollen and inflamed, and the wounds discharging freely. The left fragment at the symphysis was displaced backward and slightly downward. The patient's general condition was good. The wounds were dressed with a flaxseed poultice, a Barton's bandage was applied to the head, and extra diet was ordered. On November 12th, rapid improvement had taken place, the paralysis having almost entirely disappeared. The wound, made by removing the ball, had entirely closed; the wound of entrance was still discharging slightly. One fragment of bone was removed from the symphysis; the union was firm. The deformity existing at the time of his admission into the hospital still existed to a slight extent. On December 11th, 1862, he was transferred to the Cuyler Hospital at Germantown, where he was discharged the service on January 6th, 1863. The case is reported by Acting Assistant Surgeon John Neill. The patient is a pensioner, his disability being rated one-half and permanent.

Case.—Private Robert Jeffery, Co. F, 126th New York Volunteers, was wounded at Gettysburg, July 3d, 1863. While lying on his breast, with his head raised, a ball struck him on the front of the nose, on a line with the internal canthus, fracturing the nasal bones, and, passing downward through the left antrum, the hard palate, and left side of the tongue, opposite the last molar tooth, came out on the left side of the neck, opposite the upper border of the thyroid cartilage. The wound bled freely for a short time. He was treated in field hospital until July 13th, when he was admitted to the Broad and Cherry Streets Hospital, Philadelphia. Several small spiculæ of bone had been removed. The patient's general condition was good. Simple dressings were applied, the mouth was frequently washed with a solution of borax, and a fluid diet was ordered. Under this treatment he improved rapidly. A few days after admission, several small fragments of the nasal bones were removed, and by August 1st the wound of entrance had entirely closed, occluding the left nostril. The wound through the hard palate had diminished in size, leaving a fistulous opening communicating with the left antrum; that of the tongue had cicatrized and was adherent to the side of the jaw by false adhesions, and traumatic paralysis was so well marked that in attempting to protrude the tongue it was strongly drawn to the left side; his articulation was slightly impaired. A slight discharge still continued from the wound of exit, but the patient had made a rapid recovery, with slight deformity, considering the nature of the injury. He was discharged from service on January 19th, 1864, and pensioned. Pension Examiner H. A. Potter reports, April 11th, 1864, that "the sense of smell and taste are gone and the voice much impaired. He has difficulty in deglutition, and much prostration on slight exertion. It seems to be on the left side. The pneumogastric nerve must be involved in some way. The left side of the tongue is paralysed."

Case.—Private R. R. Kates, Co. H, 12th New Jersey Volunteers, aged 22 years, was wounded at Chancellorsville, May 3d, 1863, by a musket ball, which entered the mesial line of the upper lip, carried away almost the entire superior maxilla of that side, and emerged about two inches behind the left ear. He was taken to the hospital of the 3d division, Second Corps, and, on May 8th, transferred to the Douglas Hospital, Washington, where fragments of bone were extracted. There were some pieces of bone deeply imbedded in the neck, and small fragments were daily discharged from the mouth. On June 8th, a tooth was extracted from the neck behind. He was furloughed on June 26th, at which time the posterior wound had healed; the upper portions of the bone were still inflamed; he could swallow easily, but spoke indistinctly. He was returned to duty on September 29th, 1863. His name does not appear upon the Pension Roll.

Case.—Private James Kelly, Co. I, 31st New York Volunteers, aged 26 years, was wounded at the battle of Gaines's Mill, Virginia, June 27th, 1862, by a conoidal musket ball, which entered near the middle of the angle of the left lower jaw, splintering the outer wall of the maxillary bone, passed downward, across the neck, between the trachea and the œsophagus, fractured the right clavicle, and lodged beneath the lower edge of the pectoralis major muscle. He lay on the battle-field all night, and was taken, on the next day, to Savage Station, where he remained a day and a night, when, fearful of being taken prisoner, he walked to Harrison's Landing, a distance of twenty miles. On July 1st, he was sent to Fort Monroe, where a piece of dead bone was removed from the jaw. On July 2d, he was transferred to Philadelphia, entering Satterlee Hospital on the 7th. When admitted, his general health was good. An opening at the point of entrance of the ball being explored by means of a probe, loose pieces of dead bone were readily felt. The probe, a very large ball-headed one, was passed down along the track of the ball to the furrow marking the junction of the trachea and œsophagus. The passage between these had healed up. The patient stated that, for several days after the reception of the injury, he had considerable difficulty in swallowing. A large swelling existed at the right side of the neck, and, on July 9th, fluctuation being perceptible, an opening was made at

its most prominent point, about opposite the middle of the neck. On July 11th, the ball being distinctly felt under the lower edge of the pectoralis major muscle, Acting Assistant Surgeon John H. Packard made an incision and removed it without difficulty. The swelling at the side of the neck soon diminished, and the orifice made on July 9th came down so as to be on a level with the clavicle, large portions of which were removed from time to time, and fragments of the jaw also came away through the wound made by the entrance of the ball. The opening by which the ball was extracted healed up very readily. There was considerable swelling near the middle of the right clavicle, owing to a deposit of new bone. A small opening existed at the orifice of entry, and a sinus extended down toward the lower edge of the jaw, but no dead bone could be felt. The patient recovered, and was discharged from service on February 5th, 1863. He is not a pensioner.

CASE.—Private Francis H. Kirker, Co. E, 100th Pennsylvania Volunteers, aged 20 years, was wounded at Bull Run, August 29th, 1862, by a small rifle ball, which entered on the left side of the nose, at the junction of the nasal bone with its cartilage, and, passing obliquely across and slightly backward, emerged one inch above the angle of the lower jaw, on a vertical line with the external meatus, tearing away a part of the lobe of the ear. He was conveyed to Washington, entering Georgetown College Hospital on September 6th; on February 4th, 1863, he was transferred to Broad and Cherry Streets Hospital. He stated that the wound bled freely at intervals for several days, and that several small pieces of bone had been removed. On admission, the wound of entrance and exit had healed. There was partial paralysis of the muscles of the right cheek and some deafness on that side from injury to the nerves. There was slight ptosis of upper lid and partial loss of vision in the right eye. The opthalmoscope revealed a congested state of the retina. He was discharged from service on March 19th, 1863, and pensioned. Pension Examiner A. R. McClure reports, April 6th, 1867, that there is necrosis of the superior maxilla, and that the pensioner is unable to perform any labor without causing pain.

CASE.—Private John McNalley, Co. H, 81st Pennsylvania, aged 23 years, was wounded at Fredericksburg, Virginia, December 13th, 1862, by a round musket ball, which entered on the left side of the nose, on a line with the internal canthus of eye, fractured the nasal bone, and, passing obliquely across, fractured the right superior maxillary bone and penetrated the cheek opposite the second molar tooth, in its course giving rise to a fistula lachrymalis on the right side. He was at once admitted to the hospital of the 1st division, Second Corps, and, on December 20th, sent to Catharine Street Hospital, Philadelphia, whence he was transferred, on February 2d, 1863, to Broad and Cherry Streets Hospital. When admitted, both wounds had closed, with little depression at the wound of entrance. The right cheek was considerably swollen. The fistula had almost healed, and closed a few days after admission. The patient stated that the wounds bled very freely, at intervals, for the first twelve hours, and that several small pieces of bone were removed on admission to Catharine Street Hospital. He complained of partial loss of vision. The ball of the eye was slightly atrophied, and its pupil considerably larger than the other, and irregular and slow in action. An examination with the opthalmoscope showed the vessels of the retina to be in a congested condition. He was discharged from service on March 31st, 1863. He is not a pensioner.

CASE.—Private William Madison, Co. H, 118th Pennsylvania Volunteers, aged 46 years, was wounded at Blackburn's Ford, September 20th, 1862, by a conoidal ball, which entered just in front of the coronoid process, on the left side, passed through the cheek and soft palate, and emerged on a line with, and about one-half an inch below, the lobe of the right ear, tearing away the uvula and the lateral half arches and fracturing the ramus of the jaw on the right side just above the angle. He was conveyed to Philadelphia, and admitted into the Broad and Cherry Streets Hospital on September 27th, 1862. The patient stated that, immediately after the injury, he suffered from loss of blood, and before leaving the field the surgeon removed some tissue from his mouth. On his admission into the hospital, the right cheek was swollen and inflamed, and both wounds were discharging slightly. The upper fragment of the bone was displaced, backward and inward; the parts within looked very well. The right side was dressed with a flaxseed poultice; the left side with a warm water dressing, and a Barton's bandage was lightly applied. Extra diet in a liquid form was ordered. The patient complained of a loss of sensation in the right half of the lower lip, owing to a division of the inferior dental nerve at the seat of the fracture. He improved rapidly, and on November 1st, 1862, was convalescent, the wound of entrance having closed, the wound of exit discharging slightly, and the bony union firm. He was transferred to the Veteran Reserve Corps on April 21st, 1863. The case is reported by Acting Assistant Surgeon John Neill. On December 13th, 1865, Pension Examiner E. A. Smith reports that the sense of taste is destroyed, tongue paralysed on the left side, and hearing in right ear and sense of smell are much impaired. He rates the disability three-fourths and probably permanent.

CASE.—Sergeant Alfred Malone, Co. K, 6th West Virginia Cavalry, aged 39 years, was wounded at Springfield, Virginia, June 26th, 1864, by a pistol ball, which entered the left cheek one inch and a half from the angle of the mouth, on a line with the external canthus of the left eye, passed horizontally beneath the nares, and emerged two and a half inches from the right angle of the mouth, on a line with the meatus auditorious externus, fracturing both sides of the superior maxilla. One molar and two bicuspid teeth on the right side were removed by the patient himself at the time of the injury. He was admitted, on the next day, to the hospital at Cumberland, Maryland. When admitted the incisors and canine teeth, attached to a fragment of the superior maxilla, were hanging loosely between his lips; the left bicuspid teeth were displaced, and the root of the left canine tooth was cut off and remaining loose above the fracture. A very offensive fœtid odor accompanied the discharge from the wound. Several fragments of bone had come away by suppuration, and others were exposed, but so attached to the muscular tissue as to prevent their removal without danger of hæmorrhage. The anterior palate was cut through and hung pendulous in the mouth. The bleeding was free at first, but was completely arrested by cold water applications. The fractured teeth and maxilla were placed in position with as much care as possible, and supported by a tin splint so formed as to fit over the upper lip and beneath the superior incisors, and held in position by a T bandage. The mouth was cleansed with a weak solution of chlorinated soda, and resin cerate applied to the wounds of the cheeks, with stimulants and nourishing diet internally. Under this treatment the patient rallied, and on July 1st, the bad odor had ceased; healthy granulations were forming rapidly. Several fragments of bone had been discharged. On July 22d, the patient's health was good. The wound

through the superior maxilla had so far united as to hold up the fragment of bone and teeth without the aid of the splint. He was furloughed on July 22d, 1864. While at home an abscess pointed through the right cheek, between the wound of exit and the angle of the mouth, which discharged pus freely and several spiculæ of bone, among them a fragment of the hard palate, one-half inch long. By September 22d, the wound of the left cheek had entirely healed. A small discharge still continued from the wound in the right cheek. The upper incisors and bicuspids were held in place by union of the soft parts, but were not sufficiently solid to use in chewing. He was transferred to the hospital at Grafton, on September 25th, and returned to duty on October 15th, 1864. He was discharged on May 22d, 1866, and pensioned. Pension Examiner E. D. Safford reports, October 28th, 1868, that "the bones have never united, and he has no ability to chew food, and is a great sufferer from facial neuralgia in consequence of the injury."

CASE.—Corporal Jacob M———, Co. G, 20th Michigan Volunteers, aged 29 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball, which fractured the right lower jaw. He was taken to the hospital of the 3d division, Ninth Corps, and, on June 8th, admitted to the Emory Hospital, Washington. On June 10th, Surgeon N. R. Moseley, U. S. V., removed several fragments of bone from the inferior maxilla. Simple dressings were applied, and, on August 6th, he was transferred to St. Mary's Hospital, Detroit, and, on October 14th, to Harper Hospital, where death resulted on December 7th, 1864, from wound, complicated with hæmorrhage of the lungs. The pathological specimen, consisting of seven pieces of bone, to which a small flattened piece of the missile is attached, was contributed to the Army Medical Museum by the operator, and is numbered 2507 of the Surgical Section.

CASE.—Private William T. Moore, Co. G, 15th Massachusetts Volunteers, was wounded at Gettysburg, July 2d, 1863, by a conoidal ball, which entered the buccal muscle of the left side of the face, passed slightly upward and emerged on the right side of the face, knocking out three teeth of the left upper jaw, and fracturing the right upper jaw. He was at once admitted to the hospital of the 2d division, Second Corps; thence sent to Baltimore, and, on July 10th, 1863, admitted into the Newton University Hospital. Immediately after admission, a fragment of the alveolar process of the right superior maxilla, containing one canine and one bicuspid tooth, was removed. The parts were then coaptated, Barton's bandage applied with cold water dressings, and liquid diet given. On July 31st, he was nearly well, and his general condition was excellent. He was transferred to the Veteran Reserve Corps on October 20th, 1863. The pathological specimen is No. 1690, Section I, A. M. M., and was contributed, with the history, by Surgeon C. W. Jones, U. S. V. This man is a pensioner; his disability is rated one-half and permanent.

CASE.—Private Madison B. Moss, Co. I, 23d Pennsylvania Volunteers, aged 31 years, was wounded at Fair Oaks, Virginia, May 31st, 1862, by a conoidal ball, which entered posteriorly, just below the right condyle of the lower jaw, and, passing obliquely forward and across, emerged at the left angle of the mouth. Most of the ramus of the right side was carried away; the lip was lacerated, and a part of the tongue on the right side, with several teeth, and their alveoli, on the left side at the point of exit of the ball, were wanting. The patient remained on the field two days, very much prostrated from the loss of blood. He was afterward removed to a private house; thence to Norfolk, Virginia, where he remained for three weeks, when he was sent to New York, and thence to Philadelphia, and admitted into the Broad and Cherry Streets Hospital on October 3d, 1862. The patient stated that the only dressing applied was lint wet with cold water, and the mouth was well syringed daily. His diet consisted of beef-tea and arrow-root. During the treatment, several pieces of bone were removed from the wound. On his admission into this hospital, the wound of the right cheek had almost cicatrized, leaving a deep scar, which extended from the ear to the angle of the mouth. The wound on the left side had entirely healed. His health was good, but he is unable to take solid food. The deformity of the soft places was such that a benefit would probably result from a plastic operation. On January 14th, 1863, the patient was transferred to the Mower Hospital, Philadelphia, where he was discharged the service on January 19th, 1863. The case is reported by Acting Assistant Surgeon John Neill. The patient is a pensioner, his disability being rated total and permanent.

CASE.—Private Michael Murphy, Co. G, 69th New York Volunteers, aged 24 years, was wounded at the Wilderness, Virginia, May 5th, 1864, by a conoidal ball, which caused a lacerated wound of the face, injured the palate, and comminuted the upper jaw. He was taken to the hospital of the 1st division, Second Corps, where detached pieces of bone were removed by Surgeon O'Meagher. On May 11th, he was transferred to Judiciary Square Hospital, Washington, whence he was returned to duty on July 12th, 1864. He is not a pensioner.

CASE.—Private Peter Rafferty, Co. B, 69th New York Volunteers, was wounded at the battle of Malvern Hill, Virginia, July 1st, 1862, by a conoidal ball, which entered the upper lip on the left side, at the angle of the mouth, passed through that side of the tongue, one-half an inch from the tip, thence obliquely across, struck the right lower jaw at a point one inch in advance of its angle, passed downward and outward and emerged through the cheek, knocking out fourteen or fifteen teeth, fracturing both jaws and cutting the tongue almost off at the middle. The same ball, fracturing the clavicle in its middle third, lodged, and was removed by the patient. He received also a gunshot fracture of the bones of the foot. A profuse hæmorrhage followed, amounting to syncope, and the patient remained insensible for twenty-four hours. Being taken prisoner, he was removed to a hospital on the field, and three days afterward was sent to Richmond, Virginia, where his wounds were dressed with cold water, but he received poor diet. He had colliquative diarrhœa for two weeks. On July 25th, 1862, he was paroled, and conveyed to Philadelphia, and, on July 29th, was admitted into the Broad and Cherry Streets Hospital in a very weak condition. The fragments of the jaw were exposed in the wound for some distance; the soft parts were sloughing, and the wound of the foot looked badly; that over the fractured clavicle had healed, with some union of the bone, the inner fragment overlapping. Lint, saturated with a solution of chlorate of potash, was applied to the wound of the cheek, and a flaxseed poultice to the wound of the foot. Stimulants and anodynes and liquid diet were given. Two large pieces of bone were removed. A few days after admission, the patient had another attack of diarrhœa, which continued two weeks, causing great prostration. Recovering from this, he improved rapidly. On November 1st, 1862, the wound of the cheek had nearly healed,

leaving a deep scar. No callous was thrown out; the jaw was drawn toward the right side, giving rise to considerable deformity, and the patient was unable to take solid food. A firm union of the clavicle had taken place. The wound of the foot had nearly healed. The patient was discharged the service on January 5th, 1863, and pensioned. The case is reported by Acting Assistant Surgeon John Neill.

CASE.—Private Aaron S———, Co. G, 1st Maine Heavy Artillery, received a gunshot fracture of the inferior maxilla, in an engagement before Petersburg, Virginia, June 18th, 1864. He was at once taken to the hospital of the 3d division, Second Corps, where Dr. A. Garcelon, a volunteer surgeon, removed five fragments of the inferior maxilla, with a lateral incisor, canine and bicuspid teeth. Death resulted on June 26th, 1864. The pathological specimen, consisting of the portions of bone removed, was contributed to the Army Medical Museum by the operator, and is numbered 522 of the Surgical Section.

CASE.—Private Samuel W. S———, Co. B, 1st New York Dragoons, aged 23 years, was wounded at Spottsylvania, May 8th, 1864, by a conoidal ball, which entered the back two inches below and a little to the right of the superior angles of the right scapula, and passing upward and forward through the neck and mouth, fractured the inferior maxilla. He received also a gunshot flesh wound of the left thigh. He was admitted into the general field hospital of the Cavalry Corps at Fredericksburg, Virginia, on May 13th, 1864; thence he was transferred to Alexandria, Virginia; and, on May 24th, 1864, was admitted into the 2d division hospital. On May 27th, a copious secondary hæmorrhage occurred from the mouth, which was arrested by the persulphate of iron, pressure, cold applications, and an elevated position. Extra diet was given. The patient died on June 4th, 1864. At the autopsy, it was found that the body of the inferior maxilla was fractured half way between the angle and the symphysis. The jugular vein just above the middle of the omo-hyoid muscle was found discolored, shriveled, closed, and, apparently, in a sloughy condition, and filled with coagulum for two inches below the wound. The hæmorrhage was evidently from this vein. The specimens are No. 2440, Sect. I, A. M. M. (two fragments, being the right half of the inferior maxilla), and 2441, Sect. I, A. M. M. (a wet preparation of a portion of the right internal jugular vein). The specimens and history were contributed by Acting Assistant Surgeon Jonathan Cass.

CASE.—Private John W. S———, Co. I, 82d Pennsylvania Volunteers, aged 21 years, was wounded at the battle of Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball, which entered at the left side of the nose, and, emerging opposite at ramus of inferior maxilla, fractured the superior maxilla at entrance and the inferior maxilla between condyle and ramus. He was conveyed to Washington, and, on June 10th, admitted to Emory Hospital, where, on the next day, the ball and upper portion of the jaw were removed, and simple dressings applied to the wound. On June 21st, he was transferred to Haddington Hospital, Philadelphia. Erysipelas, contiguous to the wound, supervened on July 6th, but disappeared under the application of iodine with stimulants internally. He was returned to duty on October 19th, 1864. The pathological specimen, consisting of one inch and a half of the right condyloid extremity of the inferior maxilla, including the articular surface, was contributed to the Army Medical Museum by Surgeon N. R. Moseley, U. S. V., and is numbered 564 of the Surgical Section. The patient is not a pensioner.

CASE.—Private *Johnson S*———, Co. D, 6th Alabama Infantry, aged 18 years, was wounded at Gettysburg, July 3d, 1863, by a musket ball, which, entering about one inch from the chin on the left side, produced a compound fracture of the lower maxillary bone, and lodged. He was admitted, on July 6th, to the hospital at Frederick, Maryland, where water dressings were applied to the wound. The location of the missile could not be determined. The patient's general condition was good. On July 10th, several small fragments of bone were extracted. The patient, apparently, did well until September 1st, the wound of jaw having healed, when he complained of pain in the neck, which increased in severity. An abscess formed on the left side of the neck, discharging, when opened, about four ounces of fœtid pus. On September 18th, it was found that air passed through the opening made into this abscess. The patient complained of a feeling of numbness in the left side of the body, followed, on the 19th, by partial paralysis, which extended into the bladder. His urine was drawn off twice a day. On September 21st, he was placed upon a water bed. The appearance of the back part of the neck indicated some displacement of the vertebra; pressure upon that part of the neck produced a gurgling sound. Complete paralysis had occurred by September 23d, and the patient's strength was rapidly failing. Milk punch was freely given, but a considerable quantity of all the liquids taken by the mouth passed out through the fistulous opening. He continued to sink, and died on September 28th, 1863. At the autopsy, the fractured jaw was found to have only partially united. The ball had lodged in the fifth cervical vertebra, producing extensive comminution. The bone was very much necrosed, and the soft parts greatly disorganized. The suppuration extended to the spinal canal; there was red softening of the spinal cord. The fistulous opening extended into the pharynx. The pathological specimen is a wet preparation of the inferior maxilla, showing a fracture of the body by a musket ball, one-half inch to the left of the symphysis, partially united by ligament. The fracture runs obliquely downward, forward, and inward, and one inch of the body of the bone, with the canine, bicuspid, and first molar teeth, had been comminuted and partially removed. Several small fragments remain *in situ*. It was contributed to the Army Medical Museum, with a history of the case, by Assistant Surgeon R F. Weir, U. S A., and is numbered 3979 of the Surgical Section.

CASE.—Private Samuel T———, Co. E, 88th Pennsylvania Volunteers, was wounded at the Alexandria Prison, July 26th, 1864, by a musket ball. He died on the same day. At the autopsy, the ball was found to have entered the right corner of the mouth and emerged just below the right ear, badly fracturing the right side of the lower jaw in several places, and rupturing the internal maxillary artery. The hæmorrhage from the internal maxillary artery was supposed to have caused his death. The specimen is No. 3350, Sect. I, A. M. M., showing the right half of the inferior maxilla fractured, and a small portion of the ball attached. The specimen and history were contributed by Surgeon Edwin Bentley, U. S. V.

CASE.—Corporal F. Augustus W———, Co. K, 111th New York Volunteers, aged 22 years, was wounded at Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal ball, which fractured the right side of the inferior maxilla. He was sent to the regimental hospital of the 111th New York Volunteers, and, on the same day, transferred to the general field hospital at Gettys-

burg; thence he was sent to Baltimore, and admitted into the Jarvis Hospital on July 15th, 1863. Owing to the amount of swelling and the extreme tenderness of the mouth, the wound was not examined. The patient was able to take food in a liquid state until noon on July 22d, 1863, when he was found gasping for breath, and died soon after. At the autopsy, it was found that the ball had entered about one inch to the right of the symphysis, shattered the inferior maxilla, passed downward inside of the hyoid bone and lodged in the thyroid cartilage. The surrounding tissues were congested and infiltrated with blood. The epiglottis was much enlarged, and the larynx filled with coagulated blood. This man never had much hæmorrhage, and no large artery was found divided. The specimens are No. 1451 (a wet specimen of the maxilla), Sect. I, A. M. M , and No. 1440 (a wet specimen of the larynx with the missile), Sect. I, A. M. M.. and were contributed, with the history, by Acting Assistant Surgeon B. B. Miles.

Case.—Private R. W———, Co. F, 95th Pennsylvania Volunteers, aged 39 years, was wounded at Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball, which entered the left side of the face at the infra-orbital foramen of the superior maxilla, and emerged between the ascending branch of the lower jaw and the transverse process of the atlas, half an inch external to the latter, in the left nuchal region, fracturing the malar bone below its infra-orbital edge and perforating the superior maxilla. He also received a gunshot fracture of the surgical neck of the right humerus. Being taken to Washington, he entered the Douglas Hospital on May 8th, 1863, suffering considerably from cough and impeded deglutition. On May 11th, there was paralysis of the facial nerves of the left side, the nerves presiding over deglutition, and the brachial nerves of the right side. The point of the tongue pointed toward the left side, on being stretched out. Several pieces of bone were removed from the superior maxilla and its sinus. The wound of the face was plugged with charpie. Desault's bandage was applied to the right arm, and stimulating diet was given. On May 19th, the fauces were red and inflamed. On May 24th, the patient, while drinking a cup of tea, became suddenly suffocated and expired. At the autopsy, it was found that ulceration of the œsophagus had taken place. The ball had barely escaped the lateral process of the atlas. There was an effusion of blood into the muscles of the neck, causing compression, doubtless, on important nerves. No manifest cause for his sudden death was discovered. The pathological specimen is No. 1239, Sect. I, A. M. M., showing the left superior maxilla and a part of the malar bone fractured by a musket ball, which carried away the upper part of the body and the orbital process and the zygomatic process of the malar broken off at its root. The pathological specimen of the fractured humerus is No. 1238, Sect. I, A. M. M. The specimens, with the history, were contributed by Assistant Surgeon W. Thomson, U. S. A.

Case.—Private Daniel S. Wilkinson, Co. K, 7th Wisconsin Volunteers, aged 20 years, was wounded at the second battle of Bull Run, Virginia, August 30th, 1862, by a conoidal ball, which entered the right side of the upper lip, just below the ala of the nose, and emerged just behind the lower jaw, near the angle, fracturing the upper and lower jaw and carrying away all the teeth on the right side. He was admitted into the regimental hospital of the 7th Wisconsin Volunteers the same day, and afterwards transferred to New York City, and admitted into the Ladies' Home Hospital on September 13th, 1862. Ordinary bandages and poultices were applied. On September 30th, 1862, a piece of bone, one-fourth of an inch in length, was removed. Several pieces of bone have been discharged from the wound from time to time. On November 9th, 1862, the bone had completely united; when the mouth was closed the coaptation between the teeth was not entire. On January 14th, 1863, the wound had entirely healed, the patient's health was good, and he was returned to duty, there being no difficulty with the jaw, excepting the overlapping of the fragments, and conseqent shortening of the body of the jaw. The case is reported by Surgeon Alexander B. Mott, U. S. V. The patient is a pensioner, his disability being rated one-half and permanent.

Case.—Sergeant David W. Scott, Co. I, 140th Pennsylvania Volunteers, was wounded at Gettysburg, July 3d, 1863, by a conoidal ball, which entered below the angle of the lower jaw, left side, passed under the tongue, and shattered the jaw on the right side. He was treated in field hospital until January 6th, 1864, when he was admitted to the hospital at Pittsburg, Pennsylvania. Simple dressings were applied. He was discharged from service on February 20th, 1864, on account of pseudo-arthrosis of both sides, preventing complete mastication. On February 22d, 1868, Pension Examiner D. Stanton reports that, there is a false joint, owing to non-union of the bone. The patient is unable to masticate solid food. His disability is rated four-fifths and permanent.

Case.—Private Dennis B———, Co. I, 22d Massachusetts, was wounded at Fredericksburg, Virginia, December 13th, 1862, by a ball, which entered above and a little forward of the posterior fold of the left axilla, passed inward, upward, and forward, and emerged just above the convexity of the left clavicle, which it shattered, again entered an inch nearer the neck, preserving nearly its original direction, finally emerging through the right cheek, breaking a few small pieces from the middle of the lower edge of the jaw. He was conveyed to Washington, and, on December 18th, admitted to Judiciary Square Hospital. There was considerable offensive discharge, particularly from the first wound of exit. About December 30th, his mind became somewhat affected, and there was great and increasing tendency to sleep. On the night of January 12th, 1863, he was attacked with violent pain in the lett hypochondrium, which was partly relieved by the application of sinapisms. On January 13th, two fragments of bone were removed with the forceps from the acromial portions of the clavicle from which they had become partially detached. On January 14th, he went to sleep after eating heartily; his breathing was shorter than usual. Upon being spoken to he opened his eyes, but closed them again; his breathing became still shorter, and with longer intervals, for about five minutes, when he died, perfectly quiet, and apparently without pain. At the antopsy, the head of the humerus was found destroyed, and the shaft fractured for three inches below it. The glenoid cavity and neck of the scapula were destroyed as far back as the supra-scapular notch; a partial fracture extended across the infra-spinous fossa. The front of the thyroid cartilage had been carried away. A notch was cut out of the under surface of the inferior maxilla, right side. The left lung was compressed by an abundant pleuritic effusion, and contained a single abscess. The parenchyma of the left lung was not examined. There was not any opening into the pleura. A drop of blood taken from the axillary vein exhibited nearly as many white as red corpuscles. The specimen, consisting of the left clavicle, scapula, and upper third of the humerus, is numbered 695 of the Surgical Section of the Army Medical Museum, and was contributed, with a history of the case, by Medical

Cadet Burt G. Wilder, U. S. A. The ball entered the posterior aspect of the shoulder-joint, and emerged at the centre of the clavicle, causing extensive comminution of the glenoid cavity and head of the humerus. The clavicle is fractured obliquely. A fissure extends transversely through the body of the scapula below the spine. The acromion and coracoid processes are detached. The shaft of the humerus exhibits several fissures. The fractured extremities of the clavicle are necrosed. The specimen shows but little attempt at repair.

Case.—Private Alvah Fassett, Co. B, 52d New York Volunteers, aged 26 years, was wounded at Fair Oaks, Virginia, May 31st, 1862, by a round ball, which entered the left side of the neck, passed through the pharynx, and emerged through the right angle of the jaw, fracturing the inferior maxilla and paralyzing the dental nerve of the right side. He was conveyed to the field hospital. The wounds bled freely; bandages and adhesive strips were applied. The patient was transferred to the White House, thence by steamer to Philadelphia, where he was, on June 4th, admitted into the Saint Joseph's Hospital. On admission, there was difficulty of deglutition. Simple dressings were applied to the wound, and nourishing diet ordered. Several spiculæ of bone were removed on July 5th, and afterwards at various times. The motion of the jaw was much restricted, and could not be closed within one-fourth of an inch, nor opened more than one-half of an inch. Some of the smaller branches of the facial nerve were injured. He was discharged the service on August 12th, 1862. The case is reported by Acting Assistant Surgeon William P. Moore. This man is a pensioner, his disability being rated three-fourths and permanent.

Case.—Sergeant Franz Wolbe, Co. E, 31st New York Volunteers, aged 31 years, received, at the battle of West Point, May 7th, 1862, a gunshot wound. The missile entered the centre of the right cheek, carrying away, in its passage, the superior maxilla and teeth, two-thirds of the hard palate, and about half of the tongue, and emerged near the angle of the mouth, on the left side, lacerating the soft parts to a considerable extent. He was, on May 14th, admitted into the general hospital, Alexandria, Virginia. The wounds were healing rapidly, and the patient doing well. He was discharged the service on August 11th, 1862. The case is reported by Surgeon John E. Summers, U. S. A. Wolbe is a pensioner. The power of speech is partially destroyed. His disability is rated total.

Case.—Sergeant Milo A. Dix, Co. C, 49th Ohio Volunteers, aged 23 years, was wounded at Nashville, Tennessee, December 15th, 1864, by a conoidal ball, which entered immediately beneath the septum of the nose, fractured both superior maxillary bones at the symphysis, and emerged at the back of the neck a little to the right of the median line, fracturing the transverse processes of the cervical vertebræ. He was treated in regimental hospital until December 17th, when he was admitted to hospital No. 1, Nashville, and, on December 21st, transferred to Crittenden Hospital, Louisville, Kentucky. Simple dressings were applied to the wounds. Death resulted on December 20th, 1864, from pyæmia. At the autopsy, two or three metastatic abscesses were found in the base of the left lung. Portions of the lower lobe of the left lung were gangrenous, and there was a small quantity of sero-purulent matter in the left plural cavity.

Case.—Corporal James Green, Co. C. 1st United States Colored Troops, aged 26 years, received a gunshot compound fracture of the lower jaw at Fair Oaks, Virginia, October 27th, 1864. He was admitted, on October 29th, 1864, to Balfour Hospital, Portsmouth, Virginia. Cold water was injected through the wound. Death resulted on November 3d, 1864, from exhaustion.

Case.—Private Joseph D. Parks, Co. A, 29th Connecticut Colored Volunteers, aged 30 years, was wounded in an engagement before Richmond, Virginia, October 27th, 1864, by a conoidal ball, which entered the left side of the face, midway between the angle and symphysis of the inferior maxillary, passed obliquely inward and outward, abrading the tongue, and emerged at the angle of the inferior maxilla, right side, extensively fracturing the bone to within the capsule of left articulation, besides greatly comminuting the body of the jaw. He was at once taken to the hospital of the Tenth Corps, being unable to articulate sufficiently distinct to be understood. On the same day, he was placed in a partially reclining position, and chloroformed by Surgeon C. M. Clark, 39th Illinois Volunteers. An incision was then made, commencing at the lobe of the left ear, carried along the inferior border of the bone to the chin, and the soft parts dissected, leaving the periosteum. After removing all the loose fragments, the stump of the left ramus was grasped with the bone pliers and disarticulation accomplished with a few strokes of the knife. A similar incision was then made on the right side to connect with the other, severing the geniohyoglossus and geniohyoid muscles, and the tongue retracted so as to fill the pharynx. The tongue was then drawn forward and retained in that position by means of a silk cord passed through it and fastened externally. The bone was then dissected the same as on the opposite side, and removed to within a short distance of the sigmoid notch, where it was found to be sound, and was severed at the upper third of ramus by a chain saw; the wound was brought together with silk sutures. Cold water dressings and compress, with paste-board support, were applied, and nourishing diet administered through a tube. The operation occupied one and a half hours time. Very little blood was lost. The only artery ligated was the facial; the others were twisted The patient was at no time unconscious, and bore the operation with great fortitude. Death resulted on November 6th, 1864, from exhaustion. The case is reported by the operator.

Case.—Private Isaac Smith, Co. H, 39th Illinois Volunteers, aged 19 years, was wounded at Deep Bottom, Virginia, August 16th, 1864, by a conoidal ball, which caused a comminuted fracture of the right inferior maxilla. He was admitted to the hospital at Fort Monroe, Virginia, August 18th, 1864, suffering from tramatic irritation and insomnia. On August 26th, Acting Assistant Surgeon S. J. Holley anæsthetised the patient, and excised the right ramus and two-thirds of the body of the lower jaw. The hæmorrhage was slight; one ligature was applied. Patient reacted promptly. On October 8th, he was transferred to Grant Hospital, Willett's Point, New York, and transferred to the Veteran Reserve Corps on May 4th, 1865. Pension Examiner C. R. Parke reports, February 27th, 1869, that "a small fistulous opening remains, from necrosed bone; serous discharge. Stooping causes dizziness. He is subject to slight indigestion, caused by inability to masticate his food thoroughly."

CASE.—Private Samuel H———, Co. G, 86th New York Volunteers, aged 32 years, was wounded at Gettysburg, Pennsylvania, July 3d, 1863, by a fragment of shell, which lacerated the cheek severely and fractured the left inferior maxilla, the lower portion of the body of the bone being severely comminuted. The alveoli were but slightly injured. He was at once taken to the field hospital, where Assistant Surgeon J. Theodore Calhoun, U. S. A., administered chloroform, and removed, piece by piece, the left half of the body of the inferior maxilla, between the central incisors anteriorly and the last two molars behind, following the line of fracture which involved the alveolar arch at those points only. The bone, which was broken across transversely, was rendered quite smooth by the bone forceps at or near the angle of the jaw. A Hey's saw was used, the soft parts being held out of the way by a spatula. During the operation, the tongue was carefully kept *in situ* by a ligature passed through its tip and held by an assistant. After carefully securing all the bleeding vessels, and removing the burnt or destroyed tissue, the excessively ragged wound was brought together in accurate apposition by the introduction of silver pins with a wire figure-of-8 suture. On July 16th, he was transferred to McKim's Mansion Hospital, Baltimore, and on November 21st, 1863, to Patterson Park Hospital, where he was reported as convalescent. In a letter to this office, dated May 28th, 1866, the operator states that "the cicatrix is nearly four inches long, and is almost hidden by his beard. His appearance is quite good. He lives mainly upon food of a semi-solid consistence, and complains of indigestion to some extent." The pathological specimen, consisting of the excised portion of bone, was forwarded to the Army Medical Museum by the operator, and is numbered 1532 of the Surgical Section. Not a pensioner.

CASE.—Private Daniel Beckhorn, Co. E, 8th New York Heavy Artillery, aged 18 years, was wounded at Cold Harbor, Virginia, June 3d, 1864, by a conoidal musket ball, which entered the mouth, fractured the lower jaw, and emerging at its right angle, passed through the right shoulder, injuring the head of the humerus. He was conveyed to Washington, and, on June 8th, admitted to the Emory Hospital. Cold water dressings were applied, and, on June 11th, he was transferred to Patterson Park Hospital, Baltimore. On June 13th, ten fragments of bone were removed from the jaw, and, on July 1st, three pieces more. The dressing consisted of oakum, wet with baker's yeast. On July 20th, the remaining loose piece of jaw, containing four teeth, commenced to unite. Fragments of bone were, at various times, removed from the wound of the shoulder, which progressed favorably, and, on September 11th, the patient could move the shoulder in all directions, but the power of abduction was somewhat impaired. On September 12th, he was furloughed; on October 23d, admitted to the Mower Hospital, Philadelphia, whence he was returned to duty on April 15th, 1865. The pathological specimen, consisting of six fragments of bone from the inferior maxilla, was contributed to the Army Medical Museum, by Acting Assistant Surgeon J. W. Fay, and is numbered 3467 of the Surgical Section. The patient is not a pensioner.

CASE.—Private John Boon, Co. C, 8th Ohio Volunteers, was wounded at Chancellorsville, Virginia, May 3d, 1863, by a ball from a case-shot, which entered one inch below the right angle of the mouth, and lodged at a point one inch in front of the angle of the jaw. He was treated in field hospital until May 9th, when he was admitted to the Carver Hospital, Washington. There was a hard and painful swelling over the lower jaw, near its angle. There was no wound within the mouth. Fracture of the jaw could be detected. An abscess formed below the jaw, which was opened on May 18th, and again on the 20th, allowing the escape of considerable pus. On May 22d, a bullet was discovered within the wound, which was removed with forceps by Acting Assistant Surgeon B. F. Craig. Poultices were applied over the jaw and wound, and on June 23d, the patient was transferred to the McClellan Hospital, Philadelphia, thence on October 24th, to Camp Dennison, Ohio, where he was treated for syphilis until November 16th, 1863, when he was returned to duty. The specimen, showing a spherical leaden ball somewhat grooved at one portion, with a long fragment of bone imbedded, was contributed to the Army Medical Museum by the operator, and is numbered 809 of the Surgical Section. He is not a pensioner.

CASE.—Private Albert Bryant, Co. H, 19th Indiana Volunteers, was wounded at Antietam, Maryland, September 17th, 1862, by a conoidal musket ball, which entered at the right angle of the mouth, cut its way through the upper surface of the tongue, and fractured the lower jaw at its angle. He was treated in field hospital until September 29th, when he was admitted to the 1st division hospital, Alexandria, Virginia. There was persistent swelling and inflammation, with incessant suppuration inside the mouth and at the angle of the jaw. The jaws became fixed, three-fifths of an inch apart. On October 30th, a large piece of loose bone, triangular in shape and an inch in altitude, consisting of the angle of the jaw, was extracted by Surgeon John E. Summers, U. S. A., and the presence of the ball detected. On November 4th, the patient was chloroformed, and search being made for the ball, it was at length discovered firmly imbedded outside and beyond the angle of the jaw, whence it was extracted with very great difficulty. The patient recovered, and was returned to duty on November 18th, 1862. The missile, a conoidal ball, with a longitudinal half, obliquely and roughly torn off, and the opposite side of the cup rolled up outwardly upon itself, was contributed to the Army Medical Museum by Acting Assistant Surgeon George F. French, and is numbered 2976 of the Surgical Section. Bryant is not a pensioner.

CASE.—Private Peter Roth, Co. E, 4th United States Artillery, was wounded at Fredericksburg, Virginia, December 13th, 1862, by a musket ball, which lodged in the left superior maxilla, after having shattered the malar bone. He was admitted to the Carver Hospital, Washington, on December 21st, and on January 8th, 1863, transferred to Patterson Park Hospital, Baltimore, where, on January 11th, Acting Assistant Surgeon Theodore Artaud extracted the ball and fragments of bone. After the extraction of the ball, the probe could communicate freely with the antrum of Highmore. The wound healed with some depression The patient was returned to duty in June, 1863. The pathological specimen, a very greatly battered leaden bullet, was contributed to the Army Medical Museum by the operator, and is numbered 4554 of the Surgical Section. Roth is not a pensioner.

CASE.—Private Daniel C. Uffelman, Co. B, 198th Pennsylvania Volunteers, aged 19 years, was wounded at South Side Railroad, Virginia, April 1st, 1865, by a conoidal ball, which entered one quarter of an inch to the left of the symphysis, and fracturing the jaw badly, emerged under the chin; reëntering the neck just beside the trachea, and lodged, as was supposed, in the cervical vertebræ. He was at once admitted to the field hospital of the 1st division, Fifth Corps, where the teeth and some

pieces of bone were removed. On April 4th, 1865, he was sent to the depot field hospital of the Fifth Corps, thence transferred to Washington, and, on April 7th, admitted into the Finley Hospital. On April 14th, two pieces from the symphysis of the inferior maxilla were removed by Surgeon G. L. Pancoast, U. S. V. Splints and simple dressings were applied. Special diet was given. On May 19th, he was transferred to the Mower Hospital at Philadelphia, where he was mustered out of service on June 5th, 1865, in accordance with general order from the War Department, dated May 3d, 1865. The specimen is No. 4288, Sect. I, A. M. M. (two small fragments from the symphysis of the inferior maxilla, one inch long by one-fourth of an inch wide), and was contributed, with the history, by the operator. Uffelman is not a pensioner.

CASE.—Private John Shultz, Co. H, 7th Wisconsin Volunteers, aged 28 years, was wounded at Gettysburg, Pennsylvania, July 1st, 1863, by a conoidal ball, which entered at the right superior maxilla, passed backward and downward, and lodged under the integuments below the mastoid process of the temporal bone. He was admitted, on the next day, to the Seminary Hospital at Gettysburg, where the ball was removed, and, on July 12th, he was transferred to Turner's Lane Hospital, Philadelphia, whence he was transferred to the Veteran Reserve Corps on November 4th, 1863. The missile, showing the apex flattened upon the body, and the base laterally compressed, was contributed to the Army Medical Museum by Acting Assistant Surgeon David Burpee, and is numbered 4533 of the Surgical Section. Schultz is not a pensioner.

CASE.—Corporal James P. Stewart, Independent Battery E, Pennsylvania Artillery, aged 25 years, was wounded at Brown's Ferry, Tennessee, October 28th, 1863, by a musket ball, which entered the right cheek just above the angle of the lower jaw, passed horizontally through and emerged from the centre of the left cheek, fracturing the inferior maxilla upon the right side, opening the maxillary antrum, fracturing the palatine arch and the body of the superior maxilla on the right side, lacerating the soft palate and nearly severing the tongue. He was admitted, on the next day, to hospital No. 2, Chattanooga, Tennessee. Deglutition and speech were entirely suspended. Simple dressings were applied to the wound, and beef soup and milk given twice a day by means of a stomach tube passed into the pharynx. Under this treatment the patient commenced to improve, and by November 16th, the external wounds had nearly healed; he was able to speak indistinctly and swallow a little. No further information can be obtained until April 11th, 1864, when he was admitted to the hospital at Pittsburg, Pennsylvania, whence he was discharged from service on May 3d, 1864. The powers of deglutition, mastication, and articulation are seriously injured. He is a pensioner.

CASE.—Private Henry A. Preston, 4th Rhode Island Battery, was wounded at Antietam, Maryland, September 17th, 1862, by a round ball, which entered at the roots of the molar teeth of right side, upper jaw, and passed out at the angle of the left inferior maxilla, comminuting the bone to the extent of two inches. He was conveyed to Baltimore, and, on September 21st, admitted to the Newton University Hospital. On September 23d, Surgeon C. W. Jones, U. S. V., removed the fragments of bone by dilating the opening made by the exit of the ball. The wounds healed rapidly with but slight deformity, and the patient was returned to duty on November 13th, 1862. The pathological specimen, consisting of two fragments and the crowns of two molar teeth from the left side of the inferior maxilla, was contributed to the Army Medical Museum by the operator, and is numbered 463 of the Surgical Section. He is not a pensioner.

CASE.—Corporal H. H. Pryor, Co. H, 11th Pennsylvania Volunteers, aged 29 years, was wounded at Antietam, September 17th, 1862, by a conoidal ball, which entered the left side of the nose, just above the lower edge of the nasal bone, passed obliquely across through the antrum on the right side, and emerged just below the malar process, causing difficulty of respiration and partial loss of sight of right eye. Free hæmorrhage followed for about twenty minutes after he received the injury, when it ceased, and did not return. He was admitted into the Broad and Cherry Streets Hospital, Philadelphia, on December 11th, 1862. He stated that one or two small pieces of bone were discharged from the wound of entrance; that the only treatment he received was the application of a simple dressing to the wound, and that at no time did the wound give him much trouble. On his admission into this hospital the wounds had entirely healed with very slight deformity. He was discharged the service January 9th, 1863. The case is reported by Acting Assistant Surgeon John Neill. Pryor is a pensioner.

CASE.—Sergeant Cyrus C. Holmes, Co. G, 18th Massachusetts Volunteers, was wounded at Bull Run, Virginia, August 29th, 1862, by a conoidal ball, which entered at the symphysis of the lower jaw on the median line, passed downward and backward, and emerged about two inches from the place of entrance, knocking out two of the canine teeth, two bicuspids, and the first molar of the right lower jaw. He was conveyed to Alexandria, Virginia, and admitted into the 3d division hospital on September 1st, 1862. Loose fragments of the jaw were removed. He was discharged the service on October 27th, 1862, with rigidity and loss of power of the muscles of the jaw, caries of the bone, and fistulous ulceration of the glands. The case is reported by Surgeon Edwin Bentley, U. S. V. Holmes is a pensioner.

CASE.—Corporal Asa W. Taylor, Co. D, 83d New York, aged 32 years, was wounded at Antietam, September 17th, 1862, by a musket ball, which entered at the posterior edge of the right sterno-cleido mastoid muscle, just below the occiput, and emerged just below the left nostril, fracturing the lower jaw a little anterior to the ramus of the right side, destroying several teeth, passing through the hard palate, and knocking out two of the front teeth. He was sent to Frederick, Maryland, and, on September 24th, 1862, admitted into Hospital No. 1, and, on September 27th, was sent to the Sixteenth and Filbert Streets Hospital at Philadelphia. On his admission, the wounds were suppurating moderately. There was no fever, or constitutional irritation. The voice, at first lost, was partially regained. A bandage was applied to the fractured jaw, and cerate dressings to the wounds; soft and liquid diet was ordered. He was discharged the service on December 30th, 1862, doing well in all respects. The case is reported by Acting Assistant Surgeon A. D. Hall. Taylor is not a pensioner.

CASE.—Private Samuel Yoder, Co. D, 3d Pennsylvania Reserves, aged 21 years, was wounded at Bull Run, Virginia, August 29th, 1862, by a conoidal ball, which entered the right cheek, at the anterior edge of the masseter muscle and emerged

at the chin, close to the symphysis, carrying away two inches of the body of the right inferior maxilla and extensively lacerating the soft parts in the floor of the mouth. He was sent to Alexandria, Virginia, and admitted into the 3d division hospital on September 1st, 1862. Fragments of bone were removed from time to time. Slight inflammatory action ensued. He was discharged the service on December 1st, 1862, with partial anchylosis of the jaw. The case is reported by Surgeon Edwin Bentley, U. S. V. Yoder is a pensioner, his disability being rated total and permanent.

Case.—Private G. W. Gibson, Co. C, 4th Vermont Volunteers, was wounded during the seven days' battles in June, 1862, by a conoidal ball, which entered the middle third of the inferior maxilla, left side, passed downward and backward, and made its exit at a point over the spine of the left scapula. He was admitted into the McKim's Mansion Hospital, Baltimore, July 25th, 1862. Eight small fragments of the inferior maxilla were removed from beneath the upper third of the sterno-cleido-mastoid muscle. On September 19th, 1862, the patient was transferred to the West's Buildings Hospital, Baltimore, where he was discharged the service on October 9th, 1862, for phthisis. The specimen is No. 413, Sect. II, A. M. M., and was contributed, with the history, by Surgeon L. Quick, U. S. V. He is a pensioner; his disability is rated one-half.

Case.—Private Ellis Ullom, Co. H, 110th Ohio Volunteers, aged 31 years, was wounded at Monocacy, Maryland, July 9th, 1864, by a conoidal musket ball, which entered one inch before the prominence of the left malar bone, passed directly through, and escaped one inch below the ear, fracturing the superior maxillary bone. He was treated in field hospital until August 16th, when he was sent to the Chester Hospital, Pennsylvania. On admission, his general health was poor, and he suffered severely from pain in the head. Both wounds were discharging healthy pus; pus was also discharged from the external auditory meatus. The hearing of the left ear was entirely gone. There was paralysis of the right arm immediately after the injury, which still continued. Several pieces of bone were removed, and stimulants and nutritious diet administered. By August 26th, the discharge from the wound, pain in the head, and paralysis of the arm had diminished, and he had some power over the hand and fingers. He was transferred, on September 23d, to Turner's Lane Hospital; on October 1st, to Filbert Street Hospital, and, on March 6th, 1865, was returned to Turner's Lane Hospital, where galvanism was applied daily. On May 9th, 1865, he was discharged from service. He is a pensioner. The sight of the left eye is entirely gone, from paralysis of the nerves. His disability is rated total and permanent.

Case.—Captain John Algoe, Co. A, 10th Michigan Volunteers, aged 31 years, was wounded at Jonesboro', Georgia, September 1st, 1864, by a conoidal ball, which passed through the lower edge of the ramus of the inferior maxilla, comminuting the bone and tearing the parts extensively. The tongue lay upon the sternum. He was taken to the hospital of the 2d division, Fourteenth Corps, where Surgeon Edward Batewell, 14th Michigan Volunteers, removed the fractured portions of bone, sawed off the ends of the angles, and brought the edges of the wound together by interrupted sutures. At the end of three weeks all had united, except at the lower extremity of the right angle, where the loss of substance had formed a fistulous opening. The surrounding tissues were loosened, an incision about one inch and a half long was made through the opening, and the edges that had been pared brought together and retained in position with pins and twisted suture. At the end of six weeks, the wounds were perfectly healed, and his general health was not at all impaired. A fibrous tissue appeared to take the place of the bone, and afforded considerable resistance to the upper teeth in mastication; but the tongue seemed to be the chief agent made use of by nature to compensate for the loss of the lower jaw. On October 25th, 1864, he was sent to the Officers' Hospital, Lookout Mountain, Tennessee, and discharged from service on March 8th, 1865. He is a pensioner, his disability being rated total and permanent.

Case.—Private John H. Spear, Co. H, 29th Massachusetts Volunteers, aged 32 years, was wounded before Petersburg, Virginia, July 29th, 1864, by a conoidal ball, which perforated and broke the nasal process of the upper jaw on the left side, passed obliquely downward, and emerged near the right angle of the mouth, fracturing, in its course, the superior maxilla and hard palate, and base of the lower jaw. He was taken to the hospital of the 1st division, Ninth Corps, where the front of the superior maxilla and a portion of the hard palate were excised, and simple dressings applied to the wound. On August 1st, he was admitted to Harewood Hospital, Washington, whence, on October 22d, 1864, he was transferred to the Veteran Reserve Corps. In February, 1865, he was furnished with an artificial jaw, at which time the wound had healed. He is a pensioner. The fissure through the roof of the mouth causes great inconvenience in deglutition; fluids are thrown through the nose. His disability is rated total and permanent.

Case.—Corporal Alfred W. Smith, Co. D, 9th Maine Volunteers, aged 29 years, was wounded at Fair Oaks, Virginia, October 27th, 1864, by a conoidal ball, which fractured the inferior maxilla. He was taken to the hospital of the Tenth Corps, where the fractured portion of the bone was removed and simple dressings applied. On October 31st, he was sent to the hospital at Fort Monroe, whence he was furloughed on December 26th, 1864. He was discharged from service on October 29th, 1865. He is not a pensioner.

Case.—Sergeant Elias Gabriel, Co. B, 24th Iowa Volunteers, aged 24 years, was wounded at Cedar Creek, Virginia, October 19th, 1864, by a conoidal ball, which entered the right side of the face, close to the ala of the nose, passed outward, and emerged on a line with, and one inch behind, the lobe of the left ear. He was taken to the hospital of the Nineteenth Corps, where simple dressings were applied to the wound. On October 25th, he was transferred to the hospital at York, Pennsylvania. There was a discharge of serous fluid from the left ear, the hearing of which was entirely destroyed. He was unable to close the left eye, but there was some motion in the lids. The wound of exit had nearly closed. By November 2d, both nostrils were discharging, and there was paralysis of the muscles of the left cheek. He was transferred to Davenport, Iowa, on December 15th, 1864, and discharged from service on January 5th, 1865. On October 29th, 1869, Pension Examiner W. Wakefield reports that the injured bones are in a diseased condition, and exfoliating, causing pain, discharge from the nose, deafness of the right ear, and paralysis of the right side of the face.

CASE.—Private William McDaniels, Co. F, 5th United States Colored Troops, aged 22 years, was wounded at Deep Bottom, Virginia, September 29th, 1864, by a musket ball, which entered anterior to and below the right malar bone, and ranging backward, downward, and obliquely to the left side of the face, emerged over the left angle of the inferior maxilla. He was treated in field hospital until October 5th, 1864, when he was admitted to the Balfour Hospital, Portsmouth, Virginia. On October 15th, a fragment of bone was removed. Simple dressings were applied to the wound, and stimulants given internally. He improved slowly and steadily, and, on June 27th, 1865, was transferred to Fort Monroe, whence he was mustered out of service on October 14th, 1865. He is a pensioner. The wound healed, leaving quite a large opening into the nares between the roof of the mouth and the soft palate. There is partial anchylosis of the lower jaw. His disability is rated one-half and permanent.

CASE.—Corporal Thomas H. Matthews, Co. I, 198th Pennsylvania Volunteers, aged 26 years, was wounded before Petersburg, Virginia, March 29th, 1865, by a conoidal ball, which entered below the left ear, and emerged below the left eye, fracturing, in its course, the condyle and coronoid process of the inferior maxilla and zygomatic process of temporal and malar bones. He was at once taken to the hospital of the 1st division, Fifth Corps, and on April 2d, sent to Harewood Hospital, Washington. When admitted, the left side of the head and face was very much inflamed, with slight erysipelas in right eye and face; he suffered also from the effects of the shock of the injury and transportation from Petersburg. On April 14th, the zygomatic process of the temporal and fragments of the malar bone were removed. By May 19th, the patient had fully recovered, with the exception of a slight anchylosis. He was discharged from service on May 29th, 1865. He is a pensioner. Pension Examiner H. S. Woodruff reports that he is almost totally blind in the left eye, and deaf in the left ear. He is affected with fainting fits, on stooping. His disability is rated total and permanent.

CASE.—Private Joshua Simmons, Co. G, 74th Ohio Volunteers, aged 32 years, was wounded at Jonesboro', Georgia, September 1st, 1864, by a round ball, which fractured the inferior maxilla, right side. He was sent to the hospital of the 1st division, Fourteenth Corps, where simple dressings were applied to the wound. On October 27th, he was transferred to Hospital No. 2, Nashville, Tennessee, whence he was discharged from service on February 16th, 1865, on account of anchylosis of the jaw. He is a pensioner.

CASE.—Private William Higginson, Co. B, 131st New York Volunteers, aged 35 years, was wounded at Winchester, Virginia, by a musket ball, which caused a compound comminuted fracture of the left inferior maxilla, and lodged in the spinous process of the left scapula. He was taken to the field hospital of the Nineteenth Corps, where the ball was removed, and simple dressings applied to the wound. On October 12th, he was transferred to the hospital at Frederick, Maryland. Fragments of bone were removed on November 4th. He was furloughed on March 13th, 1865, and, on April 5th, was admitted to Grant Hospital, Willett's Point, New York. On June 2d, he was transferred to De Camp Hospital, whence he was discharged from service on June 16th, 1865, on account of loss of half of lower jaw. He is a pensioner. Pension Examiner G. S. Gale reports that the remaining portion of the lower jaw does not match the upper, and mastication is quite imperfect.

CASE.—Private Henry Morgan, Co. D, 77th New York Volunteers, aged 24 years, was wounded before Petersburg, Virginia, April 2d, 1865, by a conoidal ball, which entered at the left superior maxillary bone, facial surface, passed inward and downward into the mouth, destroying all the upper teeth on the left side. He was admitted, on the same day, to the hospital of the 2d division, Sixth Corps; simple dressings were applied to the wound. On April 12th, he was transferred to Harewood Hospital, Washington. When admitted, the right side of the head and face were very much inflamed, erysipelas closing both eyes, which disappeared under appropriate treatment, and, on May 1st, the patient was doing well. He was discharged from service on June 8th, 1865. He is a pensioner.

CASE.—Private Ferdinand Lauersdorf, Co. D, 6th Wisconsin Volunteers, aged 28 years, was wounded in an engagement on the South Side Railroad, near Petersburg, Virginia, March 31st, 1865, by a fragment of shell, which struck the body of the lower jaw, and tore away the entire anterior portion of the bone. He was conveyed to the hospital of the 3d division of the Fifth Corps, and, on April 6th, sent to Campbell Hospital, Washington, whence he was discharged from service on July 14th, 1865, on which date a photograph was taken at the Army Medical Museum. The fractured extremities of the jaw had united, and the wound had nearly healed. The movements of the jaw were very limited, but deglutition was but slightly interfered with. He is a pensioner.

CASE.—Private John Keil, Co. K, 102d Pennsylvania Volunteers, aged 25 years, was wounded at the Wilderness, Virginia, May 5th, 1864, by a conoidal ball, which entered at the inner canthus of the left eye, passed through under the nose, and lodged in the right antrum of Highmore, penetrating the right superior maxilla, and knocking out the second molar tooth on the right side. He was conveyed to Washington, and admitted into the Stanton Hospital on May 11th, 1864. On May 23d, the wound of entrance had nearly healed; there was a purulent discharge from the right nostril, and a fissure in the anterior part of the superior maxilla, the length of which could not be satisfactorily ascertained. A probe was readily passed into the antrum. Assistant Surgeon George A. Mursick, U. S. V., made an incision from the angle of the mouth to the lower edge of the malar bone, turned up the flap of the cheek, applied a large trephine over the antrum, removed a button of bone, and extracted the ball, which was found lying loose in the antrum. The patient's constitutional condition was good. On May 24th, he had some fever and swelling of the cheek. On May 25th, the swelling of the face had increased and was erysipelatous in character. On May 27th, the swelling having nearly subsided, the sutures were removed. The lower half of the incision had united by first intention; the remainder was suppurating; the discharge from the nostril had diminished, and the patient was doing well. On August 1st, the wound had not healed; there was an opening over where the bone was trephined. Some small pieces of bone were discharged, both from the wound of operation and the nostril. The patient was able to chew his food well. On September 3d, 1864, his term of enlistment having expired, he was discharged the service. The wound of

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operation had not entirely healed; a small sinus was leading to the antrum, the orifice of which was surrounded by pouting granulations, and a small piece of necrosed bone could be felt at the bottom. The cicatrix was rather large, but there was no other deformity. The specimen is No. 3374, Sect. II, A. M. M., showing the disk of bone removed from the superior maxilla, with the battered and flattened ball. The specimen and history were contributed by the operator. On March 8th, 1865, Pension Examiner G. S. McCook reports that the jaw is exfoliating, and rates the patient's disability three-fourths and permanent.

CASE.—Private Hugh F. Creighton, Co. A, 1st New Jersey Volunteers, aged 45 years, was wounded at Spottsylvania, Virginia, May 10th, 1864, by a canister, which carried away all his upper teeth and fractured the lower jaw. He was conveyed to Alexandria, Virginia, and admitted into the 3d division hospital on May 13th, 1864, and thence, on June 7th, transferred to the Mower Hospital at Philadelphia. Simple dressings were applied to the wound. He was discharged on June 29th, 1865. The specimen, No. 2702, Sect. II, A. M. M., consists of seven fragments of bone from the inferior maxilla, including the coronoid process and the greater part of the ramus. It was contributed by Assistant Surgeon J. T. Calhoun, U. S. A. Creighton is a pensioner, his disability being rated total and permanent.

CASE.—Private George Messenger, Co. K, 114th Pennsylvania Volunteers, aged 34 years, was wounded at Chancellorsville, May 3d, 1863, by a conoidal ball, which entered the right side of the lower jaw, opposite the canine tooth, passed around, and emerged opposite the left canine, fracturing the alveolar process. He was taken to the hospital of the 1st division, Third Corps, and, on May 9th, sent to Harewood Hospital, Washington. On May 10th, Surgeon Thomas Antisell, U. S. V., brought the edges of the wound together by hare-lip suture. He was afterward transferred to the 24th Regiment, Veteran Reserve Corps. On October 19th, 1864, he was admitted to Ricord Hospital, Washington, with a view of being operated upon to relieve the deformity which still existed, but his system was too low to warrant it. The wound had entirely healed. The angle of the mouth at right side was drawn down, and there was also great loss of substance. He was returned to duty on May 27th, 1865.

CASE.—Private Albert Silsbee, Co. D, 86th New York Volunteers, aged 18 years, was wounded at Beverly Ford, Virginia, June 9th, 1863. While lying on his left side, his head being toward the enemy, the missile, probably a buckshot, entered just anteriorly to the tragus of the ear, making a wound having an incised appearance, and lodged somewhere near the ramus of the jaw. He was admitted, on the next day, to Lincoln Hospital, Washington, where water dressings were applied. The ball could not be discovered. There was no wound of the mouth or fauces, but considerable swelling of the right cheek, with lividity about the right eye; both eyes were slightly injected and felt sore. The patient had no bad symptoms after admission, and, as he was not suffering inconvenience from the ball, operative interference was thought unjustifiable. He was transferred, on June 16th, to West's Buildings Hospital, Baltimore, whence he was returned to duty on June 27th, 1863. He is not a pensioner. The history of this case was reported from Lincoln Hospital by Medical Cadet J. N. Hyde, U. S. A., from West's Buildings Hospital by Surgeon T. H. Bache, U. S. A. The concealment of the ball under the petrous bone, perhaps, or in the pterygoid fossa, or behind the ramus of the lower jaw, was esteemed very remarkable, and the aspect of the entrance wound was unusual. Surgeon J. H. Brinton, U. S. V., therefore, had a careful drawing made, in color, of the wound, by Hospital Steward Stauch. This is accurately copied in the right-hand or upper figure of the chromo-lithograph. It is unlikely, but not impossible, that the missile fell out before the patient's admission to hospital.

Of the cases above enumerated, fifty-seven were fatal. But it will be observed that the abstracts are compiled from the gravest of the reported gunshot wounds of the face, and afford no indication of the average mortality after such injuries. Forty-nine of the men mentioned in the abstract are pensioned. It will be noticed that secondary hæmorrhage supervened in seventy-six cases, and that the common carotid was ligated in no less than thirteen cases, five of which had a favorable issue. In thirty-six of the cases, there was removal or secondary exfoliation or extended necrosis of bone. The diversity in the nature of the injuries forbids a rigorous classification; but it would appear that of the whole number, impartially selected, seven were fractures of both the upper and lower jaws. The upper maxilla was principally involved in twenty-two cases; the lower in eighty cases; the buccal cavity and tongue in three cases. In twenty-seven cases the destruction of the nasal, lachrymal, turbinate, or malar bones is particularly noted.

Section III.

PLASTIC OPERATIONS.

Special reports were made of the following cases of blepharoplastic, rhinoplastic, and cheiloplastic operations, of staphyloraphy and of complex operations for vicious cicatrices or losses of tissue in various portions of the soft parts of the face.

Case.—Private Garrett Rozell, 16th New York Battery, aged 36 years, was wounded in an engagement at Chapin's Farm, Virginia, September 29th, 1864, by a piece of shell, which tore away the eyebrow, eyelid, and part of the temporal and malar bones, left side, completely extirpating the left eye, and opening a wound into the nasal bone one-fourth by one-eighth of an inch in extent, leaving the loose appendages turned inward and hanging over the cheek as low as the middle of the nose. He was sent to the hospital at Fort Monroe, Virginia, which he entered on October 2d. He was furloughed on December 20th. On February 27th, 1865, he was admitted to the hospital at Elmira, New York. The wound had healed, but a fistula existed in the nose. On March 31st, 1865, a plastic operation was performed by Acting Assistant Surgeon A. Merrill, while the patient was under the influence of ether. The lid and brow were dissected away from the unnatural adhesions, their old positions as far as possible resumed, the cicatrized surfaces again made raw by a removal of the skin, and seven sutures taken and adhesive straps used to retain the lid in its place. Erysipelas ensued. The parts healed, and on July 21st, 1865, Rozell was discharged from the service and pensioned. Examiner John G. Orton, M. D., reports, July 27th, 1867, that the face is so badly disfigured that he will ever be an object of pity, and unable to gain a living, except in seclusion from society.

Case.—Sergeant Alexander Miller, Co. A, 2d Ohio Volunteers. Shell wound of face. Fracture of zygoma and inferior maxilla, destruction of eye and laceration of soft parts of face and of arm from shoulder to elbow. Hoover's Gap, Tennessee, June 27th, 1863. Plastic operation to repair the loss of right angle of mouth. Returned to duty December 22d, 1863. Discharged and pensioned.

Case.—Private John Oaks, Co. F, 118th Pennsylvania Volunteers, aged 47 years. Fragment of shell struck the superior extremity of nasal bone, lacerated inner canthus of right eye, and destroyed the lachrimal duct. Fredericksburg, Virginia, December 13th, 1862. Transferred to Veteran Reserve Corps. In February 1864, the cornea was dull and dry, owing to want of proper secretion. Paralysis of facial nerve, drawing the mouth upward and to the side. Ectropion of lower lid. Plastic operation performed February 25th, 1864. Extirpation of right eye on August 8th, 1864. Discharged April 13, 1865. Not a pensioner.

Case.—Corporal Andros Guille, Co. K, 97th Ohio, aged 32 years, was wounded on November 25th, 1863, at the battle of Missionary Ridge, by a fragment of a shell, which carried away the entire nose to the turbinated bones and upper lip, with the anterior portion of alveolar process of superior maxilla from the right to the last two molars on left. He also received fracture of metacarpal bone, and contusion of right shoulder from fragments of the same shell. He was admitted to No. 8 Hospital, Nashville, on January 28th, 1864. His constitutional condition good. Fissure of face triangular in shape, from apex to where lip should be, two and a half inches in length; at base, from one side of pressure to the other, about three-fourths of an inch. Nasal bones came away, leaving their septum between exterior and posterior foramen. Suppuration nearly ceased. On February 4th, 1864, Surgeon William C. Otterson, U. S. V., performed a plastic operation; an H flap from right cheek was turned upon itself and fastened to the opposite surface with two pins and one silver suture, and a band of adhesive plaster from cheek to cheek, as a support. No anæsthetic was used. Six days after operation, stitches were removed. Eight days after, erysipelas appeared, which swelled the face and parts involved in operation so as to burst the adhesions of the new lip. After rending suture, erysipelas subsided in a few days. He was discharged on April 23d, 1864. The case is reported by the operator Guille is a pensioner; his disability is rated total and permanent.

Case.—Private Frank Hart, Co. E, 4th New York Volunteers, aged 22 years, was wounded at Antietam, Maryland, September 17th, 1862, by a fragment of shell, which caused a comminuted fracture of the inferior maxilla, detaching portions of the bone, and carrying away the integuments covering the chin, with one-half the lower lip. He was treated in field hospital until October 3d, when he was sent to the hospital at Chester, Pennsylvania. On admission, the patient presented a horribly disfigured appearance, the whole mass of flesh on the chin being carried away, with part of the bones and two of the incisor teeth. The cavity was filled with lint, and the opposite sides drawn together as much as possible by adhesive strips; still, at

first, there was at least one inch between the edges. By December 20th, the fragments of bone had all been detached. The wound had so well filled with granulations that it was but one inch in perpendicular length and one-half inch in breadth. An operation for the relief of the deformity was performed, an incision being made perpendicularly through the old cicatrix, down to the inferior edge of the bone, and the edges of the incision and part not filled with granulations pared so as to make a V-shaped space, with the base at the superior part. The old cicatrix was then detached from the bone, in order to permit the free edges of the wound to approach each other, and the parts being approximated, three hare-lip pins were introduced and fastened in the ordinary way. The parts were kept moist with a solution of acetate of lead and laudanum. The sutures were removed on the fourth day, when union, by the first intention, was found to have taken place to the extent of three-quarters of an inch at the upper part where the edges were free and the parts vital; but through the old cicatrix the union was less perfect, there remaining about one-half an inch ununited; this, however, soon closed by granulations, and by December 31st only a small opening, about the size of a pea, remained, through which the saliva dribbled. He was discharged from service on February 24th, 1863, entirely recovered.

CASE.—First Lieutenant J. W. Meeks, jr., 38th New York Volunteers, aged 31 years, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball, which entered just behind and above the left external auditory meatus, passed forward, inward, and downward through the left orbit, fracturing the orbital process of the malar bone, and emerged from the inferior extremity of the nose, fracturing, in its course, the left nasal bone. He was taken to the field hospital, where simple dressings were applied. Several spiculæ of bone were discharged from the wound of exit. The sense of hearing of the left ear was entirely lost from the first. The patient was transferred to his home from the field hospital, and discharged from service on June 2d, 1863, and pensioned. The wound did well, and healed in about eight months, the cicatrix producing ectropion of the lower lid, for which an operation was performed in 1867, with a good result, though in November, 1868, there was very slight eversion, resulting from loss of bone. The sense of hearing was still entirely lost, and Mr. Meeks stated that he occasionally detected a slight discharge from the ear.

CASE.—Private George C. Huntington, Co. H, 142d New York Volunteers, aged 18 years, was wounded near Richmond, Virginia, October 27th, 1864, by a conoidal ball, which caused a wound of the right cheek. He was taken to the Flying Hospital of the Tenth Corps, where Surgeon David McFalls of the same regiment performed an operation. Simple dressings were applied, and he was transferred to Balfour Hospital, Portsmouth, whence he was discharged from service on May 27th, 1865.

CASE.—Major Ephraim Dawes, 53d Ohio Volunteers, aged 25 years, was wounded at Dallas, Georgia, on May 25th, 1864, by a conoidal ball, which struck the lower jaw on the left side, one inch and a half from the chin, passed through the mouth, and emerged through the right side, comminuting the bone, destroying the lower lip, and wounding the under part of the tongue. He was taken to the field hospital of the Fifteenth Corps, where loose fragments of the alveolar processes, chin, and jaw, were removed. On June 3d, he was admitted to the Officers' Hospital, Nashville, and on September 10th, to the Grant Hospital, Cincinnati. The patient's general health was good. On September 22d, Professor G. C. Blackman chloroformed the patient, and performed an operation for restoration of the lower lip. Hare-lip and interrupted sutures, with transverse adhesive straps, were used, and water dressings applied. The patient was discharged on October 25th, 1864, at which time the lower lip was entirely restored; but the fracture remained ununited. On September 16th, 1867, Pension Examiner G. O. Hildreth reported the patient to be able to masticate readily by means of artificial teeth; but that the injury affected his general health. He rated his disability one-half. The patient, being dissatisfied with this rating, appealed, and, upon another examination, his disability was rated as total.

CASE.—Elbert Ernest, saddler, Co. C, 9th Iowa Cavalry, aged 31 years, being admitted for small-pox into the Small-pox Hospital at St. Louis, was treated there until July 2d, 1864, when he was admitted into the Marine Hospital in very feeble health, and with a perforation of the right cheek, the orifice being about three-fourths of an inch in circumference. On July 9th, 1864, Surgeon A. Hammer, U. S. V., performed a plastic operation. Wire sutures were used, and simple dressings applied. The patient was discharged on August 12th, 1864, for "central opacity of both cornea, arising from varioloid, not much improved." The case is reported by the operator. On January 16th, 1868, Pension Examiner W. F. Peck reports that the patient's vision is totally extinct.

CASE.—Private John H. Felch, Co. L, 2d Massachusetts Cavalry, aged 24 years, was wounded at the battle of Fisher's Hill, Virginia, September 22d, 1864, by a conoidal ball, which carried away the greater portion of the lower lip, half of the lower jaw, and the front incisors. He was treated in the National Hospital, Baltimore, and, on October 20th, 1864, was sent to the Harvey Hospital, Madison, Wisconsin. The remaining portion of the lower lip had firmly adhered to the jaw, anteriorly, and as far laterally on each side as the canine teeth. A fold of mucous membrane projected at each corner of the mouth. An abscess had recently opened under the right body of the jaw, which had healed. The provisional callus thrown out had been partly absorbed, and the inflammatory deposits about the jaw nearly removed. All the contraction of the soft parts that could ensue had taken place, and the saliva continually flowed from the mouth, obliging him to wear a pad and bandage over it. On January 23d, 1865, Surgeon H. Culbertson, U. S. V., performed the following operation: The flaps having been marked out, a curvilinear incision was made from angle to angle of the mouth, the convexity downwards, leaving a portion of the remnants of the lower lip one-fourth of an inch wide, adherent to the jaw, which was turned down so as to prevent the new lip from contracting adhesions to the jaw in front. Quadrilateral flaps were then raised from below the jaw, and the mucous membrane detached and stretched to the margin of the new lip, which extended towards the middle line of the lip, about one inch from either angle. The two flaps were approximated in the middle line by four pins and figure-8 ligatures. Triangular spaces at base of jaw were dressed with dry lint. As the angles of the mouth were too rounded, a small V-shaped portion was taken out of each, and the edges of each approximated by a needle and thread. There was no stress on the flaps, and no vessels divided that required taking up. Immediately after the operation, three-fourths of a grain of morphia was given, and

the patient enjoined not to move his face or lip. On January 24th, the flaps having taken well, he was ordered to lay on his side, that the discharges might readily flow off from the mouth, and the attendants were instructed to remove gently and frequently the moisture from and about the flaps. He was allowed chicken broth, and cold water and lint dressings were applied. This man was discharged on May 13th, 1865, and pensioned, his disability being rated total and permanent. The case is reported by the operator.

CASE.—Corporal Henry Gibbs, Co. K, 67th Ohio Volunteers, was wounded at the battle of Winchester, Virginia, March 23d, 1862, by a musket ball, which entered at one angle of the jaw, passed under the tongue, and emerged at the other, fracturing the lower jaw at both angles and in its body. He was conveyed to the Union Hospital at Winchester, Virginia, and, on March 27th, Surgeon S. F. Forbes, 67th Ohio Volunteers, made an incision from the angle of the mouth on the right side to the orifice of exit, and removed the whole of the lower jaw. A plastic operation was then performed, pins put in, and in four weeks the patient had entirely recovered without any apparent external deformity. He was admitted to the hospital at Camp Chase, Ohio, July 2d, 1862, and discharged from service on July 4th, 1862. He is not on the Pension List.

CASE.—Private Peter Jordan, Co. E, 2d Connecticut Heavy Artillery, was wounded at Cold Harbor, Virginia, by a fragment of shell, which carried away the lower incisor teeth, with a large portion of the anterior part of the lower jaw, and destroyed the whole under lip. He also received a severe wound of the left hand. He was treated in the hospitals at Blackwell's Island, New York, and New Haven, Connecticut, and, on October 16th, he was admitted into the Readville Hospital, Massachusetts. On November 28th, 1864, Acting Assistant Surgeon Francis C. Ropes dissected up the soft parts from the jaw, and retained them as high as possible with bandages. Dressings of chloride of soda were applied. There was a slight sloughy appearance for a few days. Healthy granulations set in, and the wound healed, with some improvement in appearance and comfort of patient. He was discharged on January 16th, 1865. The case is reported by the operator. On January 24th, 1870, Pension Examiner J. W. Toward reports that the saliva constantly dribbles from the patient's mouth. The mouth presents a shocking deformity, which, in a great measure, excludes him from society. He has had three operations performed on his lip.

CASE.—Private Donald Gray, Co. E, 38th New York Volunteers, aged 38 years, was wounded at Fredericksburg, Virginia, December 13th, 1862, by a round musket ball, which entered just under the right eye, fractured the upper maxilla, not materially separating the fragments, and lodged. On admission to the Satterlee Hospital, Philadelphia, December 23d, 1862, the cheek was greatly swollen. On January 3d, 1863, the swelling having considerably subsided, the ball was removed from behind the masseter muscle by an incision. Numerous fragments of bone were found firmly imbedded in the ball, and an abscess, which had formed in its place of lodgement, discharged freely, and was kept open by the introduction of a tent. On the 22d, the wound had entirely healed. Gray had been wounded once, in the Crimea, in the head, and four times during the late war. One of these wounds had disfigured his nose. The right side was slit, at the junction of the ala and septum, for about half an inch, and on the left, a $\wedge$-shaped portion was lost at the same place. On February 11th, 1863, Acting Assistant Surgeon W. W. Keen, jr., operated on the right side, simply paring the edges, and approximating by five sutures. On the left side, the mucous membrane and fascia of the ala and septum were everted, their edges pared and approximated by sutures. A plug was also placed in this side to prevent inversion, and cold water dressings were applied. The edges united perfectly, except a portion of the elevated flaps, which, after a second opening, March 1st, 1863, united firmly, and completely filled up the gap. This man was discharged on March 14th, 1863, on account of inability to eat any hard food. He applied for a pension, but his claim was rejected, there being no disability.

CASE.—Citizen Henry Kennedy, aged 19 years, was admitted to the General Hospital at Little Rock, Arkansas, on August 23d, 1864, with loss of the inferior lip from mercurial gangrene, the superior margin of the cicatrix being firmly adherent to the periosteum covering the inferior maxilla. His constitutional condition was very good. On August 24th, Surgeon E. A. Clark, U. S. V., performed a rhinoplastic operation by dissecting the cicatrix and paring the edges, and drawing up the tissues of the skin and retaining them in conjunction with the remaining portions of the lower lip. Simple dressings were applied. The patient was returned to duty on September 29th, 1864. The case is reported by the operator.

CASE.—Lieutenant Adam Miller, 2d Massachusetts Volunteers, aged 23 years, was wounded on August 9th, 1862, at the battle of Cedar Mountain, by an elongated musket ball, which entered below the right orbit, and traversing the nasal fossæ, emerged through the left orbit, destroying the globe of the left eye, and lacerating the left lower eyelid. He was made a prisoner, and taken to an hospital at Charlottesville, Virginia, where his wound ultimately cicatrized with great deformity. Having been exchanged, he entered the New York Eye Infirmary, and, on April 10th, 1863, ether having been administered, a plastic operation was performed, by Dr. Henry B. Sands, for the restoration of the eyelid. The operation was eminently successful, and, on April 22d, 1863, the parts were sufficiently healed to permit the insertion of an artificial eye. Although the lachrymal sac and puncta were destroyed, little inconvenience was experienced from stillicidium. Lieutenant Miller was, subsequently, transferred to the 7th Regiment Veteran Reserve Corps. A photograph was taken in April, 1866, and is numbered 135 of the Surgical Series. He is a pensioner; his disability is rated one-half.

CASE.—Private *W. M. Wyatt*, Page's battery, 1st Virginia Artillery, aged 46 years, was wounded on September 13th, 1863, by a fragment of shell. He was admitted into the No. 1 hospital, Richmond, Virginia, September 17th, 1863. The lower jaw, from the first molar tooth of the right side, nearly to the angle of the jaw on the left side, the soft tissues forming a portion of the cheeks, the whole lower lip and the original covering of the chin were carried away. His appearance was frightful and most pitiable. Sloughing had commenced. In a few days, however, the sloughing ceased; and, although suppuration was profuse and very offensive, the granulating process became fully established. On November 10th, he was well enough to go home on a furlough. He returned to the hospital early in January. Cicatrization had occurred. Irregular and lumpy cicatrices extended into the cheeks from the corners of the upper lip, which had been involved in the wound, down to the throat; and the tongue appearing in the chasm representing his mouth, adhered to the transverse edge of the cicatrix two inches below the border of the upper lip. It was determined to make a new lower lip, if possible, by dissecting the tissues of the throat and

cheeks, sliding them to a level with the border of the upper lip, and securing them in position by sutures. The operation was performed on January 10th, 1864, without chloroform, as it was desirable that the patient should not incur the danger of blood passing into the air passages. An incision, three inches long, was made downward in the centre of the tissues of the throat, terminating about the middle of the thyroid cartilage. From the termination of this incision another was carried, first on the right side and then on the left, upward and backward, toward either angle of the jaws, each to the extent of three inches, and the two flaps were marked out. These flaps were then dissected one-fourth of an inch in thickness, from the subjacent tissues, so that, when the dissection was completed, the two flaps, each being seized at the central incision, could be raised and brought up so as to present an opposing margin or surface to the upper lip. As was anticipated, the flaps now required to be incised to prevent the edges, by which they were to be united, from overlapping; accordingly, about a quarter of an inch in width was removed from each flap along the edges. Being again brought up to the border of the upper lip, the flaps were united in a central line by interrupted sutures of silver wire. Two incisions were then made from either angle of the new mouth upward; the lumpy and unsightly cicatrices were cut out, and the wounds united by silver wire. Adhesive strips and a bandage completed the operation. Directions were given as to diet and drink, and an anodyne was administered. On the fourth day perfect union occurred, and, with the exception of the suture at the upper end of the central line, which ulcerated through, all was doing well. The sutures produced no irritation, and were not removed until the tenth day, when the parts were perfectly consolidated. The wound below suppurated and granulated kindly. On March 1st, the patient left the hospital for his home greatly improved in appearance and in his power of articulation. The case is reported by the operator, Surgeon C. B. Gibson P. A. C. S., and illustrated in the Confederate States Medical and Surgical Journal for July 1864, p. 104.

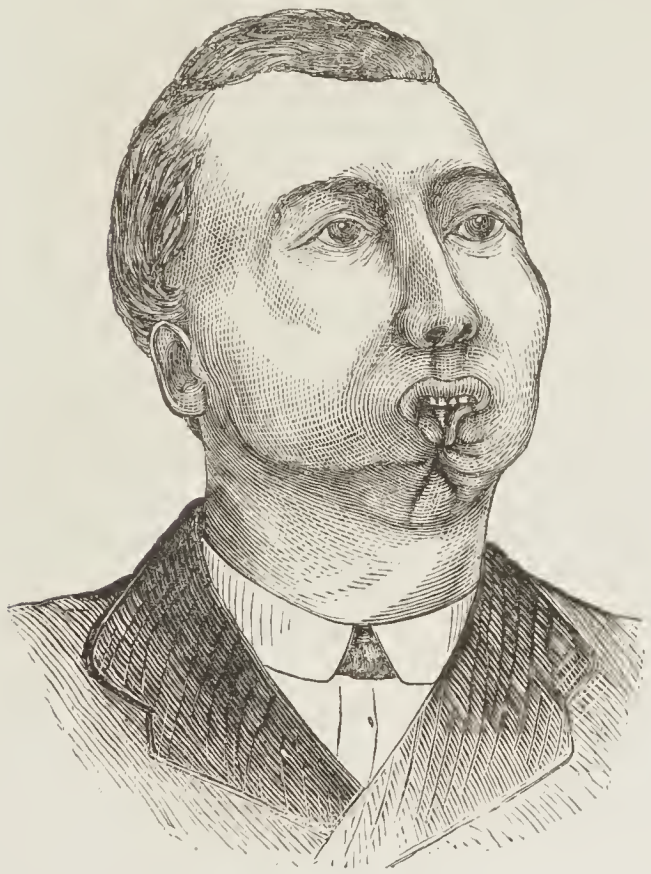

FIG. 162.—Cicatrix after a gunshot wound of the chin. From a wax cast. *Spec.* 349, Sect. I, A. M. M.

CASE.—Private John S———, Co. B, 1st New York Mounted Rifles, aged 29 years, received, on July 12th, 1863, at Indiantown, North Carolina, a gunshot fracture of the lower jaw, by a conoidal ball, which carried away the right anterior portion as far back as the second bicuspid tooth, and, on the left side, as far back as the second molar. He was treated in the regimental hospital until August 29th, 1863, when he was admitted to the Balfour Hospital, Portsmouth, and, on November 2d, 1863, sent to the St. Joseph's Hospital, New York. His constitutional condition was good. Wound cicatrized in mesial line, approximating the two fractured ends of the jaw. Patient entirely destitute of a chin; he could not articulate distinctly; constant dribbling of saliva from mouth. On December 26th, 1863, ether was administered, and Assistant Surgeon J. W. S. Gouley, U. S. A., performed an operation for reconstruction of the lower lip and chin. The incisions united by first intention, except at a point corresponding to the tip of the chin, where suppuration was established in twenty-four hours. Local applications of lead and opium were used. Nourishment and stimulants were given by the rectum, each enema containing fifteen drops of Magendie's solution, and repeated once in four or five hours. On the second day, the patient was able to take nourishment by mouth through a funnel with a long narrow gutta percha tube. He was discharged on September 1st, 1864. The case is reported by the operator. On April 1st, 1865, Pension Examiner W. M. Chamberlain reports that the patient has lost his speech and power of mastication, and rates his disabilities as total and permanent. A cast of the head and face, taken just previous to the operation, is copied in the wood-cut (FIG. 162), and a cast of the lower part of the face, taken eight months after the operation, is represented by FIG. 163.

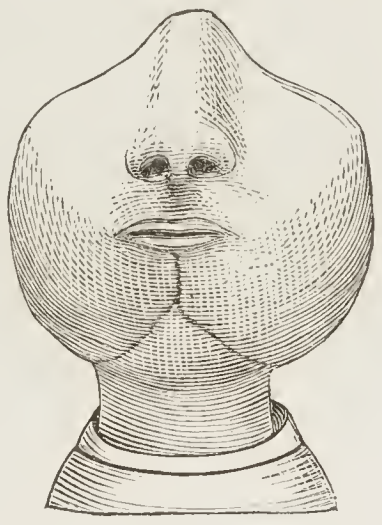

FIG. 163.—Result of a cheiloplastic operation. From a plaster cast. *Spec.* 560, Sect. I, A. M. M.

CASE.—Private Andrew Nelson, Co. G, 6th New York Heavy Artillery, aged 27 years, was wounded at Spottsylvania, Virginia, May 19th, 1864, by a conoidal ball, which passed through the lower maxilla at the symphysis, and emerged from the neck on the left side, thence passed through the shoulder-joint, fracturing the clavicle and acromion process. Two inches of the jaw at the symphysis was carried away. He was admitted to the Emory Hospital, Washington, May 22d, and to the Haddington Hospital, Philadelphia, on June 1st, 1864. He was very much debilitated. Food, in liquid form, was taken with difficulty, and there was extensive laceration and displacement of the parts. Some spiculæ of bone were removed from the left scapulo-clavicular articulation, the gap in the chin was approximated by adhesive plaster; bandage and charpie were applied to absorb profuse saliva, and cold-water dressings were applied. Power of intelligible speech was lost. June 20th, appetite good; jaw used in attempting mastication. June 30th, speech could be understood; eat toasted bread soaked. July 10th, abscess over hyoid region lanced; no bone detected. July 15th, divided the integument from gums; pared the edges, and brought the parts together by two sutures over needles. July 18th, pin suture having torn out, pared edges on board, and again applied two sutures. July 20th, hope of bringing edges together abandoned, but orifice is filling up; salivary discharge far less. August 8th, molars have approximated tolerably; patient eats and talks well; abscesses have formed under the chin, and discharged

spicula. The patient was discharged on August 27th, 1864. Operator, Dr. Nordman, Acting Assistant Surgeon. On November 12th, 1867, Pension Examiner S. Phelps reports the wound in the lower lip to be united by a cicatrix, so that the saliva constantly escapes. Articulation is imperfect, and mastication impossible. He rates his disability as total and permanent.

Case.—Private Archibald P———, Co. C, 16th Wisconsin, aged 19 years, was wounded at Atlanta, Georgia, July 21st, 1864, by a conoidal ball, which entered at the lower border of the left malar bone, and, fracturing it, passed transversely to the right, dividing the soft parts in its course, separated the lower lid of the left eye at the inner angle, fractured the nasal process on the left side, divided the alar cartilages close to their attachment to the bony margin of the nose, and passed out at the right alar cartilage. On October 19th, 1864, he was admitted to the Harvey Hospital, Madison, Wisconsin. The lower eye-lid was drawn downward and outward, exposing the mucous membrane of the lid. The nose was drawn upward, and to the left, the septum being bound down by adhesions to the bony margin. There were dense cicatrices across the cheek, and an opening large enough to admit the point of a probe, communicated with the nasal cavity. On December 12th, 1864, Surgeon H. Culbertson, U. S. V., plugged the nostrils and made one incision along the inner margin of the injured eye, carried downward one-fourth of an inch below the lower margin of orbit, and outward and upward three-quarters of an inch from external orbital angle. The attachment of the lid, and the parts included by the incision were divided. Another incision commenced over the left malar bone, extending through the lower edge of the transverse cicatrix. The right alar cartilage and the transverse cicatrix were removed. The left cheek was raised and carried upward. Another incision was made from beginning of first, downward along the base of the left side of the nose; the cicatrices and inner angle of the eye were dissected out, and the parts placed in position. A flap from the right cheek was raised to fill up the gap extending transversely across the nose. On December 20th, flaps not having adhered at the inner corner of the left eye, and the lower eye-lid having receded at the inner angle, the edges were pared, the eye-lid was placed in position, and a flap taken from the forehead to fill up the gap. On January 14th, 1865, another operation was performed, the object being the division of the pedicles, and the replacement of them, so far as possible, in their original beds: 1st, the pedicle *a* was divided in the line *c*, and the upper and inner surfaces thinned with the scissors, and a bed made for it at *c*, and two sutures passed at its upper extremity. The pedicle was then straightened by incisions, so as to remove all incurvation, and cut from its base a triangular shape, point upwards, and a bed made in the new growth of the forehead, in which the flap would neatly lay, and the flap secured with four sutures and plasters. 2d. The pedicle *b*, on right side of nose, was divided vertically and turned down, made angular, and a bed made for it, as seen at *b*, secured by two sutures and plasters. Patient was put in bed, and his hands tied down to his side; perfect rest enjoined in a recumbent position. Rice water was given No water applied as a dressing. He was discharged on May 31st, 1865. The case is reported by the operator. This man is a pensioner Examining Surgeon A. W. Dunton reports that the sight of the left eye is lost and there is a constant discharge from near the nose, and rates his disability as total and permanent.

Fig. 164.—Plastic operation for deformity from gunshot. (From a drawing by the operator.)

Case.—Private William Semmons, Co. F, 14th New York Heavy Artillery, aged 20 years, was wounded at Petersburg, March 25th, 1865, by a fragment of shell, which entered the right cheek, fractured the zygomatic process of the malar bone, comminuted the ramus and body of the inferior maxilla, lacerated and opened the ducts of the parotid and maxillary glands, and removed all the integuments of the cheek, leaving the right angle of the mouth hanging loose. He was taken to the field hospital of the Ninth Corps, where about two inches of the alveoli of the superior maxilla was excised and the wound stitched. On April 1st, he was transferred to Armory Square Hospital, Washington. Owing to his inability to swallow, liquid food and stimulants were introduced by the stomach pump. On September 21st, he was transferred to De Camp Hospital, New York Harbor, and discharged from service on October 21st, 1865. On October 26th, he was admitted to the New York Hospital. The wounded parts had been completely cicatrized for more than two months. The face was extensively disfigured. The chin, owing to the absence of the lower jaw, had retracted and lost its prominence. On the right side of the face a cicatrix extended from the middle of the zygoma to the angle of the mouth, at which latter point it was deeply depressed and closely adherent to the alveolar margin of the upper jaw, from which the teeth had been carried away. This adhesion had drawn up the upper lip and lengthened it considerably toward the right side. The lower lip having been detached by a laceration vertically at the right angle of the mouth, and also horizontally by another laceration crossing the upper part of the chin, nearly an inch below its vermilion border, had dropped below its proper level and become adherent, leaving a separation between the two lips at the right angle of the mouth of a finger's breadth, which exposed the end of the tongue to view, and permitted a constant escape of saliva. Irregular cicatrical lines crossed each other below the left angle of the mouth, one of which passed across the left cheek nearly to its middle. All that remained of the lower jaw was the upper half of the ramus on the right side, and the entire ramus, with the angle supporting two molar teeth, on the left side. From the point where the right angle of the mouth adhered to the upper jaw, a free, callous, thick border of skin stretched across the cavity of the mouth and terminated at the left angle of the jaw, to which it firmly adhered. This was, evidently, the lacerated edge from which the lower lip had been torn by the original injury and had remained separated. It performed the important office of a substitute for the lower jaw, affording support to the tongue, the attachments of which were felt connecting with its posterior surface. The last upper molar tooth on the right side remained *in situ*. All the upper teeth between it and the left canine were gone, those beyond the canine on the

left side remaining. Upon introducing the finger into the mouth, it was found that the body of the tongue was bound on the right side to the adjacent parts by adhesion, and its movement of protrusion thereby limited. Mastication being impracticable, the patient was restricted to the use of soft solids and liquids. Deglutition was unimpaired. His articulation was very defective, owing to the confinement of the tongue by the adhesions. In consequence of this defect, the patient was averse to using his voice, and preferred making himself understood by signs and the use of a pencil and paper. His health was good, his complexion florid, and his general appearance robust. On November 7th, Dr. Gurdon Buck performed the following reparative autoplastic operation: The lower lip was detached by a horizontal incision extending along the cicatricial line crossing the chin, to a point below the left angle of the mouth. The entire thickness of the lip, with its lining mucous membrane, was divided. Its vermilion border, which had shrunken into a fan-like shape by cicatrization, could now be straightened out and applied to the upper lip throughout its entire length. To form a new angle for the mouth, a point was chosen at the margin of the upper lip, equidistant from the median line with the left angle, and at this point the border was pared away obliquely. A corresponding point was chosen on the lower lip and pared in the same manner. The two fresh cut surfaces were brought into accurate apposition and secured by sutures. The adherent right extremity of the upper lip was dissected up from the alveolar border of the jaw, and from this point an incision was carried outward and upward, along the upper margin of the cicatrix crossing the cheek as high as the zygoma. The skin and subjacent tissue were detached freely toward the orbit and temple. Another incision was then commenced below the left angle of the mouth, at a point where the incision detaching the under lip terminated, and carried to the right, across the chin, at a finger's breadth below the free callous border above described as constituting a substitute for the lost jaw. This incision was continued on obliquely upward and outward, over the cheek below, and close to the cicatrix as far as the zygoma. A third incision, beginning at the starting point of the preceding one, below the left angle of the mouth, was carried perpendicularly downward a distance of two inches upon the neck. In its course a cyst, of the size of a dollar, was encountered, filled with a brownish, transparent, viscid fluid, such as is met with in ranula, and was dissected out entire. The angle included between these two incisions, as well as the integument below, crossing the right cheek, were extensively detached from the parts beneath. An upper and lower flap, including the entire right cheek and nearly the whole chin, were thus formed. They were separated by the cicatrix crossing the cheek, which had been left *in situ*. After paring off the surfaces of the cicatrix, the edges of the flaps were brought together so as to cover it up, and secured by sutures. At the right angle of the mouth, reconstructed in the manner already described, the flaps above and below were matched to the lips and also secured by sutures. Sutures were introduced in close proximity throughout the entire extent of the flaps, so as to maintain their edges in accurate adjustment. Four of the sutures were twisted and were inserted, one at the right angle of the mouth, two upon the right cheek at points where they would afford the best support to the flaps, and one at the angle of the flaps, below the under lip. The newly constructed mouth was of medium dimensions, the lips maintaining themselves in contact and retaining the salivary secretion. The adjustment of the different parts to each other was effected without any strain upon the sutures at any one point. No adhesive plaster was used. Liquid nourishment was directed to be given through a tube, and water dressings to be applied to the face. The case progressed favorably, and by November 10th, adhesions had taken place throughout almost the entire extent of the flaps, and all the pin sutures, with most of the thread sutures, were removed. A free discharge of pus was taking place at the lower extremity of the incision under the chin, where the cyst was removed. Strips of adhesive plaster were applied at points where their support seemed needed. A superficial slough of the size of a copper cent had formed over the zygoma, which could not, however, mar the result of the operation. The suppuration below the chin gradually diminished, and ceased entirely in a few days, every part of the wound healing completely. On December 12th, 1865, the patient left the hospital to return to his home. The ability to maintain the lips in contact, and thus retain the saliva, constituted an immense amelioration of his condition. His improved appearance, and some improvement of articulation, were also results highly gratifying to the patient.

Case.—Sergeant Robert Beck, Co. G, 27th Iowa, aged 25 years, received, at the battle of Pleasant Hill, Louisiana, April 9th, 1864, a gunshot wound; the missile entered the left temple on a level, and one inch posterior to outer eminence of the left eye, and passed out one-half of an inch below the right eye, destroying in its course the left eye, the lachrymal sac, duct of right eye, and the bones, and produced ectropion of the right eye. He was admitted to the Marine Hospital, St. Louis, on April 7th, 1865. On April 27th, Surgeon J. H. Grove, U. S. V., performed a plastic operation for deformity of right eye. Simple dressings were applied. The result was perfect. He was discharged on May 13th, 1865. The case is reported by the operator. In March, 1871, Pension Examiner J. W. Smith reports that necrosed bone has been discharged, during the past year, from wound of exit; the left nostril is closed, except by forced inspiration. He rates his disability as total and permanent.

Case—Private W. H. Blanchard, Co. H, 7th Michigan Volunteers, aged 23 years, was wounded at the battle of Antietam, Maryland, September 17th, 1862, by a conoidal ball, which entered a little below the zygomatic process of the superior maxillary bone of the left side, passed through, carrying away the symphysis and palatine processes, and emerged a little above the right angle of the upper lip. He was treated in field hospital until September 23d, when he was admitted to hospital at Frederick, Maryland, where several small pieces of bone were removed. The wounds healed by January 1st, 1863. On January 3d, the patient was chloroformed, and the adhesions in line of fissure and cicatrix were set free by incisions, and the cut surfaces on either side of the cicatrix brought together by sutures after an incision on the right side of the nose for more complete adjustment. The result was very satisfactory, and by January 30th, the parts had united with very little deformity. He was discharged from service January 12th, 1863, and from hospital on February 26th. The records of the Pension Office state that in July, 1865, Blanchard was a pensioner; that he was restricted to soft diet, and was badly disfigured. His disability was rated total and permanent.

Case.—Private Rowland W———, Co. E, 4th New York Heavy Artillery, aged 46 years, was wounded at Ream's Station, Virginia, August 25th, 1864, by a fragment of shell, which destroyed and completely carried away the inferior maxillary bone and soft parts, commencing two inches anterior to the angle on the right side, carrying away the chin and all the soft parts down the neck, on a level with the hyoid bone, destroying the floor of the mouth completely, allowing the tongue to protrude and hang down on the neck; deglutition and articulation were impossible. Three of the right lower incisor teeth, with the

corresponding alveoli loosely connected with the tissue, remained, and were allowed to stay in that position until the healing process took place, as they gave a partial support to the tongue and submaxillary gland, which was not injured. The wound extended across to the left side, carrying away all the teeth and jaw bone, except those previously mentioned, to a point as high up as the angle of the inferior maxillary on the left side. He was admitted to Lincoln Hospital, Washington, August 28th, 1864. His general health was bad from scurvy. The patient did well, and improved rapidly. On December 9th, he was furloughed for thirty days, and, at the expiration of his furlough, he was readmitted to hospital in good condition. On January 20th, 1865, an operation was performed to construct a floor for the mouth—no anæsthetic was used. Preliminary to the operation, two molar teeth were extracted from the right-hand fragment of the lower jaw. An incision was made two and a half inches in length down the median line of the neck, terminating one inch above the thyroid cartilage. Two lateral incisions, one upon each side, of equal length, right-angled to the vertical incision, these incisions corresponding to the base of the jaw. These flaps were then carefully dissected up, brought together at the middle incision, and secured by three hare-lip needles, the parts being supported by adhesive straps. Frequent application of dry lint was made to protect the parts from the injurious effects of the saliva, which was being constantly secreted. The healing proceeded rapidly, the parts uniting by first intention. Power of articulation and degustation was much improved. The needles were removed on the third day. On April 22d, 1865, the parts being in a favorable condition, ether was administered, and a second operation was performed. Two incisions, one on the right and one on the left, parallel to the inferior border of the inferior maxillary bone, each three inches in length, severed both the facial arteries, which were secured by ligatures. The upper flaps were carefully dissected up, as far back as the angle of the jaw upon each side. The anterior edges of these flaps were freely incised, as well as the superior edge of the parts remaining after the first operation. The flaps were then brought into apposition and retained by four hare-lip needles, two in the upper flap forming the lip, and one upon each side, uniting the lower edge of the flap to the freshened edge of the parts after the first operation. Dry lint dressings were applied, and the patient was fed through a gum catheter. The hare-lip pins were removed from the longitudinal incision on the third day, the others being removed on the fourth day, at which time the remaining pins, together with all the sutures, were removed, the parts being supported throughout the remainder of the treatment by straps of adhesive plaster. On the morning of the 27th of April, secondary hæmorrhage occurred from the left facial artery, which was readily controlled by digital compression. Owing to the constant secretion of saliva from the sublingual gland, which was carefully preserved during the operation, a slough was produced at the junction of the inferior angle of the flaps. This was checked by the application of a week solution of nitric acid. On June 23d, the patient was discharged at his own request. A fistulous orifice, one-fourth of an inch in diameter, only remaining, in consequence of the constant secretion of saliva from the sublingual gland, which prevented the parts from closing by granulation. He is able to articulate quite plainly, which he has hitherto been unable to do since the date of his injury. Until the completion of this operation the patient was compelled to assume a recumbent position to receive his nourishment, or even a swallow of water. He can now take his food and drink without any difficulty, in an erect posture. By the use of a rubber button, properly adjusted to the fistulous orifice, the secretion of saliva was prevented from making its exit externally. The appearance of the patient, both before and after operation, is shown by photographs Nos. 167, 168, 169, 170 and 186, *Surgical Series*, A. M. M. The photographs were printed from negatives prepared at Lincoln Hospital, under the direction of Surgeon J. Cooper McKee, U. S. A., who was the operator in this case. On November 8th, 1869, Ward forwarded a letter to the Surgeon General in reference to a pension. He wrote that he was obliged to live on milk diet. The letter, with photographs and a history of his case, was forwarded to the Pension Office. He is a pensioner.

FIG. 165.—Gunshot laceration of chin. (From photograph 186, S. S. A. M. M.)

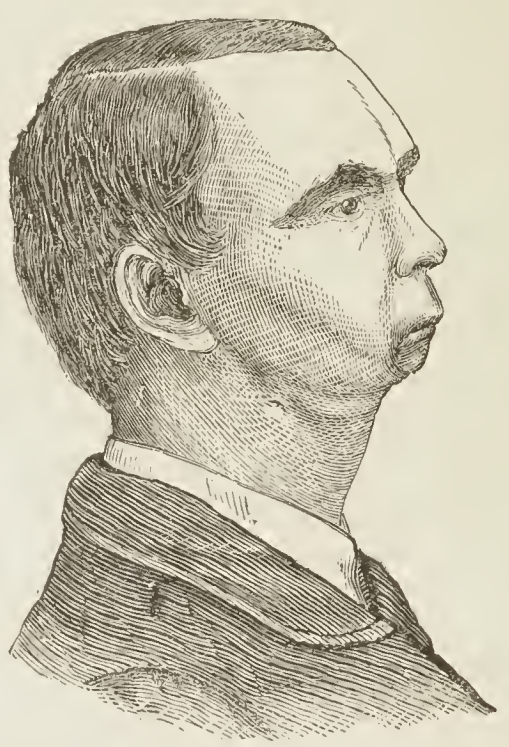

FIG. 166.—Successful cheiloplastic operation for gunshot injury. (From photograph 170, S.S.A.M.M.)

CASE.—Private Elbert Hewitt, Co. C, 6th Vermont Volunteers, aged 22 years, was wounded at Winchester, Virginia, September 19th, 1864, by a fragment of shell, which, coming from the left, struck his mouth, carrying away the upper and lower front teeth, lacerating the under lip near the right angle of the mouth, and laying open the right cheek from the mouth to near the angle of the jaw. The nose and upper lip were also split vertically. The lower jaw was also fractured at the symphysis. He was treated in the field hospital until September 27th, when he was admitted to the hospital at Frederick, Maryland, where simple dressings were applied to the wound. On November 19th, he was transferred to St. Joseph's Hospital, New York, whence he was furloughed on December 26th, 1864, and readmitted to hospital on January 25th, 1865. The injured parts had all cicatrized. The mouth had contracted. The right half of the under lip was drawn in and adhered closely to the jaw from the

alveolar margin to the chin. When the mouth was shut, a deep notch, capable of lodging the forefinger, occupied the right half of the lower lip, and allowed the saliva to escape constantly. The upper lip was shortened transversely by linear cicatrix. The right angle of the mouth puckered, from which a curved linear cicatrix extended toward the angle of the jaw. The two halves of the lower jaw were approximated in consequence of the loss of bone at the seat of fracture. On February 28th, 1865, ether having been administered, Dr. Gurdon Buck performed the following operation: The adhesions between the under lip and jaw were divided throughout their whole extent A vertical incision was then carried through the middle of the lip to a point below the chin, within one finger's breadth of the os hyoides; another incision, commencing at the right angle of the mouth, was carried downward in a converging line to join the first at its termination. The included triangular patch, consisting chiefly of cicatricial tissue was removed. The remaining left half of the lip was dissected up from the jaw laterally to a point beyond the angle of the mouth, and inferiorly to a line below the edge of the maxilla. Thus detached, it could be glided toward the right side. To supply the deficiency thus created by the removal of the right half of the lip, an incision was made transversely through the entire thickness of the right cheek from the angle of the mouth to within a finger's breadth of the edge of the masseter muscle. From the latter point, a second incision was carried downward and a little forward over the edge of the jaw, to a point on the same level as the lower angle of the space to be filled up. The quadrilateral flap thus formed was dissected up from the jaw and upper part of the neck, and, being brought forward, was adjusted to the left half of the lip by a twisted suture inserted near the vermilion border, and by several interrupted thread sutures below. In its new situation, the mucous membrane, lining the upper half of the flap to the depth of an inch, confronted the denuded surface of the jaw, from which, in the earlier steps of the operation, the adherent cicatrix had been removed. To form a new labial border for the transposed flap, a prism-shaped strip of tissue was excised from between the skin and mucous membrane above the upper edge of the flap, and the mucous membrane lapped over it and secured to the skin by fine stitches inserted close to each other. In order to extend the mouth toward the right side it was necessary to prepare the fresh cut edge of the cheek above, on a line with the upper lip, in the same manner as just described, and to the extent of five-eighths of an inch beyond the limit of the lip. At the point where the new angle of the mouth was to be established, the edges of the divided cheek above and below were accurately confronted throughout their entire thickness, and secured by a single twisted suture; interrupted sutures were employed to secure the remainder of these edges. The reconstruction of the lip being thus accomplished there still remained, to complete the operation, a space to be covered, from which the cheek flap had been transposed to supply the lip. This was done by prolonging the horizontal incision of the cheek toward the ear an inch and a half through the skin only, dissecting up the included angle, and gliding it forward to fill the vacant space, which it did without stretching. Interrupted sutures, closely inserted, were employed to secure it in its new location. But few vessels required to be ligated. Special care was taken in the new adjustment of the parts, that there should be no strain on the sutures, and, in order to render the adjustment as perfect as possible, the sutures were everywhere inserted in close proximity, with the intention of removing the alternate ones at the expiration of twenty-four hours. The loss of blood, though considerable, did not produce extreme depression of the pulse. The operation occupied about three hours, frequent interruptions being necessary to keep up the effects of the ether. No adhesive straps were employed. Tepid water dressings were directed. During the three days succeeding the operation, the swelling of the parts, though considerable, was not excessive, and febrile reaction was moderate. After that the swelling began gradually to diminish. At the expiration of the first twenty-four hours, the alternate sutures were removed, and every day following additional ones were got rid of at points where they could be safely dispensed with. On the sixth day, all the sutures had been removed, and union by adhesion had taken place throughout every part of this extensive wound. The only point where suppuration occurred was at the lower angle of the wound under the chin, which, however, was not of long duration. Before the expiration of the second week, the patient had left his bed and was about the ward. He regarded his condition as very materially improved. The saliva no longer passed uncontrolled from his mouth. Articulation and mastication were very much ameliorated. Both lips, for want of the support of the front teeth, fell in, and the symmetry of the mouth itself was considerably disturbed, three-fifths of its length being situated to the right of the median plane and two-fifths to the left. On April 13th, he was transferred to the Governor Smith Hospital, Brattleboro', Vermont, and discharged from service on July 25th, 1865. On December 12th, 1865, he was induced to enter the New York Hospital, with a view of having an operation performed for the improvement of the mouth; preliminary to which, Mr. J. A. Bishop, of New York, ingeniously adapted a plate of vulcanite to both jaws that would supply the deficient front teeth and afford support to the lips. On January 9th, 1866, the second operation was performed by Dr. Gurdon Buck, the object being to extend the mouth about five-eighths of an inch on the left side, so as to restore its symmetry to a good degree. The angle of the mouth was circumscribed by an incision along the vermilion border, involving about five-eighths of an inch of the upper and lower lip. A double-edged knife was then inserted flatwise at the angle between the lining membrane and the cheek, and the lining membrane detached in the direction in which the enlargement was to be made. The cheek alone was then divided with strong scissors, in a line with the commissure of the mouth, to the extent of three-fourths of an inch, and a narrow angular strip pared off from the fresh cut edges above and below. The subjacent mucous membrane was next divided to the same extent, and the newly formed angles of the cheek and lining membrane secured together by a twisted pin suture. The remaining edges of the mucous membrane were pared and adjusted to the corresponding edges of the cheek, and were both secured together by fine interrupted sutures inserted close to each other. Everything went on favorably after the operation, and the result was highly satisfactory to the patient as well as to the surgeon. He is a pensioner. A cast, representing the condition of the injured parts previous to the first operation, is numbered 265 of the Surgical Section of the Army Medical Museum. Another, showing the patient's appearance two months after the operation, is numbered 485. A third cast, taken January 8th, 1866, prior to the second reparative operation, represents substantially the same condition. These casts were contributed by the operator. A photograph of the case is numbered 282 of the Photograph Series of the Army Medical Museum.

Case.—Private Carleton B———, Co. B, Purnell's Maryland Legion, aged 20 years, was admitted into the hospital at Frederick, August 4th, 1862, in a prostrated condition. He had a bed-sore over the sacrum; his body was bathed in sweat and covered with sudamina. His tongue was dry and his teeth covered with sordes. It was reported that he had been sick in camp since June 5th, and that he had recently taken as treatment for pneumonia, two scruples of calomel, one scruple of mercury with

FIG. 167.—Appearance of patient with loss of upper maxilla and soft tissues, from sloughing, prior to operation. See casts and photographs, A. M. M., No. 4655, Sect. I.

chalk, and sixty-five grains of blue pill. Stimulants and nutritious diet were administered. On August 6th, a jagged ulcer was discovered on the right edge of the tongue. On the 10th, a slough appeared on the gum at the root of the right upper bicuspid tooth. The ulcer rapidly extended to the cheek and the roof of the mouth; by the 21st, it had nearly reached the orbit, the entire upper maxilla being exposed. From this date, the parts gradually assumed a healthy action, and, by the 27th, ulceration had entirely ceased. It was then close to the eye, and had removed the right ala of the nose and the right half of the upper lip from the angle of the mouth, beyond the median line, on the left side. On October 1st, the entire right superior maxilla, the vertical plate of the palate bone, and a narrow strip of the left maxilla, being quite separated from the healthy bone, were removed (FIG. 171). The great loss of substance on the right side of the face caused frightful deformity. The right eye was destroyed and sunken; the right half of the upper lip, the right ala of the nose, and the adjacent portion of the cheek, besides the right superior maxillary bone, were gone, leaving an extensive opening directly into the cavity of the mouth and right nasal fossa. The margin of the opening, which was everywhere cicatrized, was constituted below and outwardly by the border of the lower lip, which was stretched obliquely upward and outward, and terminated at the malar bone, where the superior maxilla had separated from it and where it was closely adherent. From this point, which corresponded nearly to the middle of the cheek, the margin extended upward and inward, in a curved direction, to the side of the nose, approaching within a finger's breadth of the inner canthus, and continuing thence downward along the ridge of the nose, a little to the right of the median line, and terminating at its tip. The *columna nasi* being destroyed, the left ala, and the rounded margin of the left half of the lip, which terminated nearly exactly at the median line, constituted the limit of the opening on this side. About three-fourths of an inch of the vermilion border of the lower lip, at its right extremity, appeared to have belonged to the upper lip, and to have assumed its present position, in a continuous line with the lower lip, in consequence of the adhesions which had taken place in the cicatrizing process. The integument and subjacent tissues were supple throughout the margin, up to the line of their adhesion. The walls of the cavity exposed to view by this opening, presented the following: inward, toward the median line, was the septum nasi, deflected somewhat toward the left side, incomplete anteriorly and inferiorly, where its cartilaginous portion had been destroyed, and where the anterior portion of the inferior turbinated bone, with the passage to the nasal duct of the left side, is seen. Upward, the scrolled inferior edge of the middle turbinated bone presented itself. The outer wall was a smooth, uniform surface, which was lost below in the general cavity of the mouth; the floor of the cavity was occupied by the tongue. The posterior portion of the bony palate, constituted by the palatine process of the palate bone, presented its free anterior edge cicatrized and stretching horizontally across the middle of the cavity

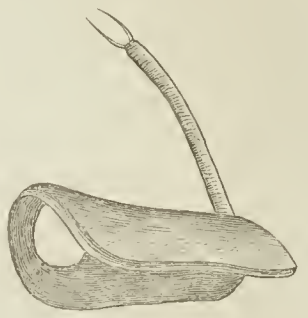

FIG. 168.—Cap for holding up roof-piece (FIG. 169. From a photograph from Mr. Gunning).

FIG. 169.—Artificial roof of mouth, with teeth. (From a photograph furnished by Mr. Gunning.)

FIG. 170.—Nose-piece devised by Mr. T. B. Gunning. (From a photograph.)

FIG. 171.—Inferior maxilla exfoliated after disease. *Spec.* 557. Sect. I, A. M. M.

FIG. 172.—Appearance of Burgan after the fifth and final operation. (After photographs and plaster casts presented by Dr. Buck.)

posteriorly. The line of separation between the two superior maxillary bones having taken place a little to the left of the median suture, the left middle incisor tooth had been carried away. The lining membrane of the cavity presented everywhere a remarkably healthy appearance. The palatine process of the palate bone, with the velum, having escaped, deglutition was performed without disturbance; his speech, however, was very indistinct, and resembled that of an individual with a bad cleft palate. A puffy condition was observed below the inner half of the lower lid of the right eye, connected, probably, with chronic irritation of the lachrymal sac; the puncta, though open, and admitting a fine probe, did not allow it to pass on into the sac. On December 22d, Burgan was discharged from service to go to New York City, entering the City Hospital on December 31st, where a plan was devised for the restoration of the parts destroyed. Before commencing the operation, dental fixtures, partly temporary, were ingeniously constructed by Mr. Thomas B. Gunning, of New York, and fitted to the cavity of the mouth to afford solid support to the soft parts that were transferred for the reconstruction of the mouth, and the closure of the cheek and nostril. Fixtures, in three parts, were made of vulcanite, two principal and one supplementary. The upper piece filled out the right half of the nose; the lower piece formed an artificial palate; the third part connected with the palate piece by bent spiral wire; the patient wore them two weeks prior to the first operation. On March 26th, ether having been administered, the first operation was performed, which consisted, first, in liberating and shaping the left half of the upper lip; second, in supplying material for the right half of the lip; third, in bringing forward the middle and lower portions of the right cheek, and adapting them to the newly transposed neighboring half of the mouth. Nothing further was attempted at this operation. It occupied at least two hours and a half; much of the time, however, was employed in the readministration of the ether to keep the patient quiet. No adhesive plasters were applied, the sutures being exclusively relied on. Warm water dressings were directed to the parts. On April 23d, the parts involved in the first operation being free from swelling and having regained their suppleness, a second operation was performed, the object of which was to improve the mouth by extending it toward the right side and converting the circular turn into an angle, which was accomplished while the patient was under the influence of ether. On June 18th, a third operation was performed to close the remaining opening in the cheek and cover the side of the nose with a flap from the forehead, which was also accomplished while the patient was under the influence of ether. On August 8th, an operation was performed to remove the deformity at the root of the nose, resulting from the previous operation, and, on October 27th, another, to remove a furrow and notch in the nose. In June, 1864, Burgan enjoyed good health, and had, for several months, been able to discharge efficiently the duties of an assistant nurse in a large ward of the New York Hospital. The hypertrophied condition of the nasal patch still persisted, and might be regarded as a permanent condition; quite the reverse of what was anticipated, it had the advantage of maintaining the side of the nose in a plump form. When the patch was pricked the sensation was no longer referred to the forehead as at first, but to the parts irritated. The cicatricial bands on the inside of the mouth had been kept from contracting by the persevering efforts of the patient, who had faithfully executed the directions given him on the subject, which were to introduce one or two fingers into the mouth and stretch the bands to their utmost endurance, and repeat the process several times daily. The only dental fixture worn by the patient at that time was the principal piece, which covered the roof of the mouth and supplied the lost teeth of the right upper maxilla (Fig. 169). It was worn constantly with entire comfort, and was removed and replaced at pleasure. When the mouth was open to its fullest extent, the forefinger could be introduced edgewise between the front teeth. Mastication of all descriptions of food was performed with facility. The speech, which, without the dental fixture, was hardly intelligible, scarcely betrayed any defect when it was worn. An artificial eye was adapted to the right orbital socket, and was worn by the patient a part of the time. A colored plaster cast of his face was prepared previous to the patient's discharge, and, with the pathological specimen, consisting of the greater portion of the right superior maxilla, showing necrosis, was contributed to the Army Medical Museum by Assistant Surgeon R. F. Weir, U. S. A., and is numbered 557 of the Surgical Section. A detailed history of the case by the operator, Dr. Gurdon Buck, will be found in an illustrated paper in the Transactions of the New York State Medical Society, for 1864, page 173. Burgan was a pensioner in December, 1871*

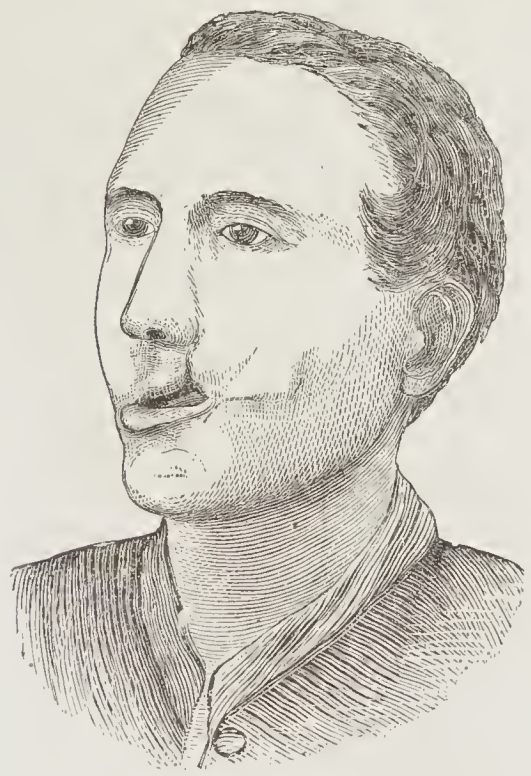

Fig. 173.—Deformity after gunshot wounds of the face. (From a photograph.)

Case.—Private John W——, Co. C, 140th New York Volunteers, aged 24 years, was wounded at the Wilderness, May 5th, 1864, by a conoidal ball, which entered the right side of the face, midway between the eye and the upper lip, passed downward and outward, emerging on the left side of the face, immediately below the malar bone, producing a compound fracture of the superior maxilla, and destroying the four front teeth, eye tooth, and three large teeth on the left side, with their alveolar processes, and part of the palate process. He received also a wound in the leg.

Fig. 174.—Result of a plastic operation in the case figured in No. 173.

* The case is figured in Prof. Otto's paper "*Methoden der plastischen chirurgie*," in Von Pitha und Billroth, *Chirurgie*, Bd. III, 2 Heft, S. 142.

On February 24th, 1865, he was admitted to Carver Hospital, Washington. The wound was entirely healed when admitted, but the cicatrix produced great deformity of the upper lip, interfering with proper articulation. On March 8th, Surgeon O. A. Judson, U. S. A., decided to operate, and having etherized the patient, made an incision from wound of entrance downward through the upper lip and a large portion of the cicatrix. The adhesions that were found beneath were dissected up, and the parts brought in apposition by pinsutures. Simple dressings were applied to the wound. The case progressed favorably, and, by March 22d, the wound had nearly healed by first intention. The lip presented a much better appearance, the articulation was greatly improved, and the patient could readily partake of solid food. On April 8th, he was transferred to Mower Hospital, Philadelphia, whence he was discharged from service on June 24th, 1865. On January 3d, 1866, Pension Examiner H. T. Montgomery reports "a large opening from mouth to nose; great permanent deformity of face; voice and mastication impaired." He rates his disability three-fourths, partly by reason of the wound of the foot.

Case.—Private Edgar M. Chaney, Co. A, 32d Wisconsin Volunteers, aged 29 years, was wounded in an engagement on the Combahee River, South Carolina, February 3d, 1865, by a conoidal ball, which entered over the right malar bone, and, passing obliquely down to the left, tore up the attachment of the tarsal cartilage near the inner canthus, destroyed the substance of the lower eyelid, passed through the nose, separated a part of the right alar cartilage and septum nasi, and emerged nearly upon the bridge of the nose, half an inch from its point. He was conveyed to Beaufort, and, on February 6th, admitted to division No 1 hospital. On February 24th, he was transferred to Grant Hospital, New York Harbor, and, on April 17th, to Harvey Hospital, Madison, Wisconsin. When admitted his consitutional condition was good. The right alar cartilage was drawn up below, so as to stand at the bridge half an inch higher than the septum nasi, while attachment at its base was natural; the left alar cartilage was somewhat drawn up at the apex of the nose; the right lower eyelid, drawn down and outward, was attached to the right malar bone and everted, with a large fold of its mucous membrane presenting; and the tarsal cartilage had united by cellular tissue at its middle third. Rest and occasional laxatives having improved the patient's condition, Surgeon H. Culbertson, U. S. V., decided on performing a plastic operation. On May 2d, 1865, chloroform was administered and the nostrils plugged. An incision was commenced at the bridge of the nose, and carried to a level with the cheek through the right alar cartilage and mucous membrane of the nose, and which extended to the point. The cartilage being then depressed to its natural level, another incisionwas extended through the skin and cicatrices, and the edges of the wound at the tip of the nose were freshened. A flap, with much cellular tissue, was next raised, gently twisted upon itself, and secured in a bed made by depressing the separated alar cartilage, as seen at *a*. The points of alar cartilage were adjusted and secured by one suture; and the edges of the gap made by the removal of the flap were approximated by sutures. An incision, parallel with the lower border of the orbit, was then made, and the cicatrix removed, and the remaining portion of the lower eyelid brought up to its natural position A flap was afterwards raised as deeply as superficial fascia—but broader than shown in the figure—reverted, placed *in situ*, as seen at *b*, and secured by sutures. The edges of the wound at *c* were approximated and secured by sutures, and additional support was furnished by adhesive strips. After the operation, the patient's hands were secured to the sides of his bed, a grain of morphine was given, lint moistened with sweet-oil was applied over the pedicles and margins of the flaps, and a slop diet was ordered. The flap beneath the eye united by first intention, and also a part of the flap of the nose; the other parts of the latter flaps healed by granulation, and were kept *in situ* by fine pins. The pedicles were divided on the 21st day, and thrown back into their original beds—*i. e.*, the part of flaps not required. This man was mustered out of service on June 8th, 1865. The lower eyelid was nearly natural in appearance; the nose was slightly depressed on the bridge, and the beds from which the flaps were taken had nearly healed. The patient appeared as indicated by the wood-cut, on which the lines of the incision are also traced.

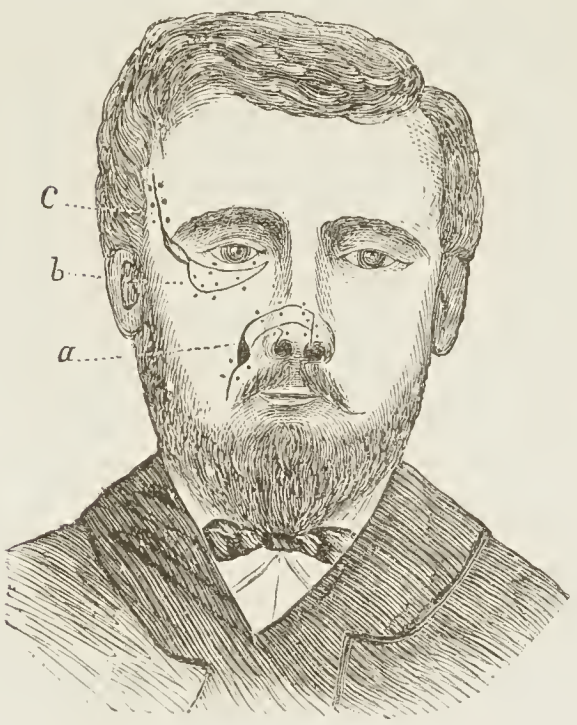

Fig. 175.—Incisions in a plastic operation on the lower eye-lid and nose. (From a drawing by the operator).

Case.—Private A. Gilbert, Co. B, 126th Ohio Volunteers, aged 24 years, was wounded at the Wilderness, May 12th, 1864, by a conoidal ball, which entered the left side of the face at a point corresponding to the body of the malar bone, passed inward and forward, and emerged at symphysis of superior maxilla. He was treated in field hospital until May 16th, when he was sent to Lincoln Hospital, Washington, where simple dressings were applied. The wound healed rapidly, leaving an opening through the upper lip. On May 28th, he was transferred to Mower Hospital, Philadelphia. On October 5th, Dr. Morton closed the opening in the upper lip by taking a flap of tissue from the left side of the face and making union as for hare-lip. Water dressings were applied. Gilbert was discharged from service May 27th, 1865.

Case.—Private *William M. Cook*, Co. K, 3d Georgia Regiment, received, at Chancellorsville, May 3d, 1863, a wound in in the face by a fragment of shell, which extensively mutilated the upper lip and nostrils. He was admitted to Hospital No. 1, Richmond, Virginia, where a plastic operation was performed about six months after the injury. He was furloughed on August 18th, 1863, for sixty days, and afterward returned to duty in his regiment.

Case.—Private Robert Spornitz, Co. B, 5th Minnesota Volunteers, was discharged from service at Fort Ridgely, Minnesota, on October 24th, 1862, on account of a gunshot wound through the upper jaw, with loss of all the upper teeth, received in a fight with Indians. The operation of staphylorraphy was successfully performed.

PLASTIC OPERATIONS.—In the foregoing thirty examples of plastic operations, the regions in which attempts at reparation were made were, in the eyelids, in six cases; the nose, in five; the cheek, in three; the lips, or palate, or other parts about the mouth, in twelve; and the chin, in four cases. On page 331, another instance of blepharoplasty is cited and on page 348, an unsuccessful case of staphylorraphy. Of the thirty-two cases, twenty-nine were for deformities following gunshot injuries. In the majority of the cases a certain measure of relief was afforded. Dr. Buck's operation (p. 374) must be reckoned among the chief triumphs of modern plastic surgery. The history of Corporal Henry Gibbs (p. 370), communicated by Surgeon S. F. Forbes, 67th Ohio Volunteers, subsequently pension examining surgeon at Toledo, Ohio, is extraordinary. The removal of the entire lower jaw "without any apparent external deformity" after four weeks, is a result rarely achieved, and it is to be regretted that the patient is not registered on the pension list, and that casts and photographs were not forwarded with the history. There were other cases in which plastic operations on the face were contemplated or unsuccessfully attempted, some of which are illustrated by photographs in the Army Medical Museum,* where the distressing deformities produced from excessive loss of tissue about the soft parts of the face, prompted surgeons to yield to the solicitations of patients, and to intervene with but slight anticipation or hope of success. There were other examples of gunshot wounds involving the ethmoid, or the nasal or other small bones of the nasal region, or the upper portions of the superior maxillæ, in which ugly fissures were left, which could not be closed because of the protracted suppuration and frequent exfoliation of minute portions of bone. Many such patients have presented themselves at the Museum. A remarkable instance is recorded on p. 329 (*ante*), the case of Sergeant Prince.† In this, and in several similar cases, where the patients were examined at periods from three to seven years after the reception of their injuries, it was found that the inconvenience likely to be caused by an autoplastic operation would scarcely compensate for the possible modification of external deformity. In cases in which the patient had long respired through the cloaca leading to the nasal passages, it was found that the anterior nares had so contracted, from disease, that a closure of the traumatic orifice was impracticable, or else that injuries of bone involving the lachrymal sac or its canal indicated that any operative interference would be almost hopeless. A study of the sufficiently detailed histories of cases on the Pension Rolls, and personal examinations of many patients and pensioners mutilated by gunshot wounds of the face, convinces me that the occasions on which autoplastic operations are likely to be employed advantageously are few in number. Now and then, by removing disorganized parts, and paring and approximating the sound tissues by twisted sutures, favorable results may be attained. But, as a general rule, the deformities following gunshot wounds of the face and suggesting some plastic procedure are either accompanied by such extensive loss of tissue or chronic disease of the osseous structures, as to forbid any hopeful undertaking in the way of reparative surgery. Thus the records of gunshot injuries of the face in the late war, nearly ten thousand in number, furnish only the few examples above enumerated. Dr. Chisholm (*op. cit.*), the author of the principal systematic treatise on military surgery in the Confederate service, does not refer to the subject, and from the accessible sources of information

* *Photographs of Surgical Cases and Specimens.* Prepared by Bvt. Lt. Col. G. A. OTIS; by direction of the Surgeon General, Washington, 1865–1870. Vol. I, p. 32; Vol. II, pp. 29, 30; Vol. III. p. 35; Vol. IV, p. 36.

† *See Photographs of Surgical Cases*, etc., *op. cit.* Vol. VII, p. 12.

regarding the surgery in the Confederate army only two cases are to be gleaned. (*Wyatt*, p. 370; *Cook*, p. 378.)

Surgeon David Prince, U. S. V., writing, in 1868, an ingenious "brief exposition of Plastic Surgery," does not advert to its applications in military surgery, and as he has evidently, carefully studied the subject, it may be assumed that these applications are few. Among the photographs filed in the Museum are several in which unavailing attempts have been made to close apertures in the cheek, caused by the perforation of musket balls. Probably the incisions were made through the inodular cicatrical tissue bordering the apertures, and had it been practicable to extend the operations by "gliding," more successful results might have been attained. From the pensioners at the Soldiers' Home and the National Asylums for Disabled Volunteers, no instances of loss of tissue from gunshot wounds have been reported where autoplastic operations could be undertaken with reasonable anticipations of success.*

A single example is reported of an attempt at otoplasty, or rather otorrhaphy, in the case of a teamster whose ear was bitten off in a fight. The auricle was completely detached and was covered with dirt. It was immediately washed in warm spirits and water and accurately stitched on by interrupted metallic sutures, and covered lightly by carded raw cotton and bandaged. But, at the end of three days, there was no attempt at union, and the detached pinna showed no sign of vitality.

There were a few instances of salivary fistulæ following gunshot wounds. Abstracts have been cited of the histories of the cases of Colonel Guiney (p 330), and of Private Hart (p. 368). The complication was uncommon, however, the laceration produced by the projectile usually sufficing to obliterate the salivary ducts. In the few cases that occurred, the ordinary measures of treatment, by occlusion, cauterization, and frequent dilatation of the excretory orifice of the canal of Steno, were employed with success.

Whatever was communicated in regard to the methods of operating in the autoplastic procedures has been specified in the abstracts of individual cases. The precepts of Jobert appear to have been commonly followed, though Dr. Buck's extraordinary operations abounded in original expedients.

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*It is unnecessary to enlarge on the literature of the subject, unless to indicate to medical officers the principal works accessible in the Library of the Surgeon General's Office, among others the *princeps* edition in vellum (1597) of Taliacotius, the Venice edition of Tagliacozzi, and several more modern reprints, or translations, of this famous Bolognese surgeon's writings and plates, and Dieffenbach's earlier essays:

TALIACOTIUS, *De curtorum chirurgia per insitionem*, Venet., 1597; FIERUS (of Antwerp), *Libri chirurgici*, Tract XII, 1612; PAULUS AEGINETA, Lib. VI, Cap. 26; FABRICIUS HILDANUS, *Observat. chirurg.*, Cent. III, Obs. 31; SCHENKIUS, *De Naribus*, Observ. 8; AMBROSE PAREY, translated by TH. JOHNSON, p, 526; FALLOPIUS, *De decoratione*, Cap. 2; SCHOTTI, *Italia illustrata*, 1640; BENEDICTUS, *De prax. med.* Lib. IV, Cap. 39; GOURMELENUS, *Chirurgia*, Lib. I; LEONARDO FIORAVANTI, *Il segretti de Chirurgia*; BLEGNY, *Zodiacus medico-gallicus*, Genevæ, 1680; CELSUS, *De re medica.*, Lib. VII, Cap. IX; FABRICIUS (ab Aquapendente), *Op. Chir.*, Cap. 61; BLANDIN, *De l'autoplastie*, Paris, 1836; BUSHNAN, *Surgical Observations on the Restoration of the Nose*, London, 1833; AMMON UND BAUMGARTEN, *Die Plastische Chirurgie*, Berlin, 1842; FRITZE, *Die Plastische Chirurgie*, Berlin, 1845 (with 48 engravings); JOBERT, *Traité de chirurgie plastique*, Paris, 1849; ZEIS, *Handbuch der plastischen Chirurgie*, Berlin, 1838; MICHON, *Memoire et observations sur quelques cas d'autoplastie de la face*, Paris, 1847; SÉDILLOT. *De l'application de la méthode anaplastique*, etc., Strasbourg, 1845; SERRE, *Traité sur l'art de restaurer les difformités de la face*, Montpellier, 1842; NASEMANN, *Questiones de rhinoplastice*, Halis, 1849; DROOP, *De usu labii superioris in rhinoplastice*, Halis, 1844; LABAT, *De la rhinoplastie*, Paris, 1840; DIEFFENBACH, *Die Operative Chirurgie*, Leipzig, 1845; CARPUE, *Account of two successful Operations*, etc., London, 1815; GARENGEOT, *Traité des operations de chirurgie*, Paris, 1748; WEISEMAN, *De coalitu partium a reliquo corpore prorsus disjunctiarum*, Lipsiæ, 1824; BÜNGER, *Gelungener Fall einer Nasenbildung*, in v. GRAEFE und v. WALTHER'S Journal, Bd. IV, p. 569; LARREY, *Clinique Chirurgicale*, Paris, 1829, T. II, p. 12; SIMS, *Silver sutures in Surgery*, New York, 1858; SKEY, *Operative Surgery*, 2d ed. p. 521; HOLMES, *A system of Surgery*, Vol. V, p. 558; C. F. v. GRAEFE, *Rhinoplastik*; FRICKE, in v. GRAEFE und v. WALTHER'S Journal, Bd. 22, p. 456; FRIEDBERG, *Chirurgische Klinik*, Jena, 1855; MALGAIGNE, *Méd. operat.*, 1843, p. 421; ERICHSEN, *Science and Art of Surgery*, p. 670; ALBUCASIS, *Chirurgia*, Lib. II, Cap. 13 et 14; THEVENIN, *Oeuvres*, Chap. 99, 100, Paris, 1659; PLATNER, *Institutiones chirurg.*, Lips. 1745, Par. 580; TEXTOR, *Ueber Cheiloplastik*, Bd. XXI, Heft 5 u. 6, p. 496; CRAMPTON, *Essay on entropium*, London, 1815; DELPECH, *Chirurgie clinique*, Tom. II, p. 587; CARRON DU VILLARD, *Restaurations des paupières*, in Gazette des hôpitaux, 1836; SANSON, *Journal universelle et hebdomadaire*, No. 162 u. 164, Nov. 1833; RUST, *Handbuch der Chirurgie*, Bd. IV, p. 575; CHOPART, *Anaplastie des lèvres, des joues et des paupières*, Paris, 1841, p. 60; VELPEAU, *Lanc. franç, gaz. d'Hôpit.*, 13, Aout, 1840; MAISONABE, *Clinique sur les difformités dans l'espèce humaine*, Paris, 1834, Tom. II, p. 100; BECK, *Handbuch der Augenheilkunde*, Heidelberg, 1823; DESMARRES, *Annales d'Oculist*, Oct. 1843; and also the works of SYME, LARCHER, FOLLIN, PARTRIDGE, NÉLATON, EARLE, COOTE, SÉE, MÜLLER, TEELE, PANCOAST, PRINCE, B. BROWN, J. M. WARREN, OLLIER, LANGENBECK, BUCHANAN, COOPER, GENSOUL, CHELIUS, DZONDY, JAEGER (Vienna), BAUM, LISFRANC, DUPUYTREN, ROUX, LALLEMAND, MOULEAU, THOMAIN, HUTCHINSON, DAVIES, SYME, TYRREL, LISTON, HOEFFT, PIROGOFF, DYBECK, and CLOT-BEY.

WOUNDS AND INJURIES OF THE FACE.

In tables XII and XIII, statements of the results of gunshot fractures and flesh wounds of the face are presented. Table XIV contains a summary of operations after wounds of the face, and table XV gives a recapitulation of the aggregate results of injuries of the face from whatever cause,—incised, or punctured, or lacerated, or contused, or gunshot,—with or without fracture, that appeared on the returns during the War:

Table XII.

Table of Three Thousand Three Hundred and Twelve Cases of Gunshot Fractures of the Bones of the Face.

REGION.	Cases.	Died.	Discharged.	Duty.	Unknown.
Inferior maxilla	1,607	121	779	550	157
Superior maxilla	555	42	247	228	38
Both maxillæ	157	13	86	46	12
Maxilla; not stated	260	33	96	80	51
Malar	218	14	95	89	20
Nasal	93	.....	26	53	14
Palate	17	.....	7	7	3
Several bones implicated	405	117	152	101	35
Aggregates	3,312	340	1,488	1,154	330

It appears from Table XII that of the two thousand nine hundred and eighty-two cases in which the results were ascertained, 11.4 per cent. died, 49.9 per cent. were discharged, and 38.7 per cent. went to duty. It has not been practicable to learn how many of the one thousand four hundred and eighty-eight discharged men were pensioned; but we can judge fairly of the proportion by analyzing the one hundred and thirty-eight* abstracts in Section II, of this Chapter, and find from the record of the eighty-one patients who recovered, that forty-nine, or 60.5 per cent., were pensioned. Hence we are forced to the conclusion that gunshot fractures of the bones of the face are, when we consider large averages, graver than writers on military surgery have, heretofore, admitted; for,

*Not *one hundred and thirty-five*, as erroneously printed on page 345.

beside the considerable rate of mortality in these three thousand cases, a large proportion of those who recovered were disabled, and invalided. The lodgement of balls in the maxillary sinuses, in the ethmoidal and sphenoidal cells, and the consequent protracted suppuration, necrosis, and exfoliation, evulsion of teeth with inability to masticate, and frequently with the persistent discharge of foul pus, and unwholesome broken-down tissues into the throat; secondary hæmorrhages from vessels not readily secured, and secondary inflammations extending to the brain; these are among the causes which bring the mortality rate of wounds of the face to within nearly a fifth of that of wounds of the head.

Table XIII.

Table of Four Thousand Nine Hundred and Fourteen Cases of Gunshot Wounds of the Face, without known Fracture.

INJURIES.	Cases.	Died.	Duty.	V. R. C.	Exchanged.	Discharged.	Deserted.	Furloughed.	Unknown.
Flesh Wounds of the Face...	4,914	58	2,147	156	93	780	187	343	1,150

Of the above 4,914 cases, seventeen were complicated with erysipelas, three with gangrene, seven with pyæmia, and nine with secondary hæmorrhage. In two cases there was neuralgia; in two, necrosis; in four, paralysis; and in one, concussion. In five cases, the hearing was impaired, and one resulted in aphonia. The missile is reported to have lodged, and without record of its being removed, in twenty-two cases; and the fact that it was extracted is recorded in sixteen cases.

Of the fifty-eight fatal cases, five died of erysipelas, two of gangrene, six of pyæmia, seven of secondary hæmorrhage, seven of pneumonia, eight of chronic diarrhœa, four of typhoid fever, three of small-pox, and one each of congestive fever, enteric fever, irritative fever, diphtheria, ascites, and spasm of the glottis, and ten from causes not stated.

Table XIV.

Nature and Results of Nine Thousand Eight Hundred and Fifteen Injuries of the Face from all Causes.

INJURIES.	Cases.	Duty.	Discharged.	Died.	Unknown.
Sabre and Bayonet wounds	64	40	15	2	7
Fractures of the bones of the face from various causes	64	37	17	3	7
Injuries of the face from miscellaneous causes	271	167	83	3	18
Gunshot flesh wounds of the face	4,914	2,396	1,310	58	1,150
Gunshot wounds of the orbital region	1,190	379	679	64	68
Gunshot fractures of the bones of the face	3,312	1,154	1,488	340	330
Aggregates	9,815	4,173	3,592	470	1,580

In the eight thousand two hundred and thirty-five cases in which the results were determined, the mortality rate was 5.7. But it was probable that this ratio would be much diminished if the termination of the remaining one thousand five hundred and

eighty cases could be traced. In the British army in the Crimea,* fractures of the face numbered one hundred and seven, and flesh wounds four hundred and twenty-six, a total of five hundred and thirty-three, or 7.4 of the entire number of wounds, and the mortality rate was but 2 6. But, in the British return, the proportion of wounds penetrating or perforating the bony structures was but 20.1 per cent. of the face injuries, whereas in TABLE XIV, the proportion of fractures is 33.5. In reporting on the casualties of the French Crimean Army, M. Chenu† records one thousand four hundred and fourteen injuries of the face from all causes, with a mortality of one hundred and eighty-four, or 13 per cent. In his statistics of the Italian war of 1859, the same author‡ tabulates nine hundred and fifty-five cases of face injuries, with one hundred and fourteen deaths, a mortality rate of 11.9.

The next table exhibits the number of operations performed after wounds of the face:

TABLE XV.

Table of Six Hundred and Seventy-one Operations after Wounds of the Face.

OPERATIONS.	Cases.	Died.	Discharged.	Duty.	Unknown.
Excision of portions of the inferior maxilla	81	8	58	9	6
Excision of portions of the superior maxilla	13	3	8	2	.....
Excision, maxilla not specified	3	.....	3	.....	.....
Excision, malar	7	2	4	1	.....
Excision, several bones	7	1	4	1	1
Removal of bone	268	16	136	98	18
Extraction of ball	192	9	92	65	26
Ligation of common carotid	52	37	11	3	1
Ligation of external carotid	6	2	2	1	1
Ligation of common and external carotid	2	1	1	.....	.....
Ligation of facial	5	1	1	2	1
Ligation of lingual	1	.....	.....	.....	1
Ligation of internal jugular vein	1	.....	1	.....	.....
Ligation of branch of superior thyroid	1	.....	1	.....	.....
Plastic operations	32	.....	27	4	1
Aggregates	671	80	349	186	56

Having furnished the statistical evidence, verified as carefully as has been practicable, we can now consider the conclusions to be derived therefrom relative to flesh wounds and fractures and operations in this region.

* *Medical and Surgical History of the British army, which served in the Crimea, during the war against Russia, in the years* 1854, 1855, 1856. London, 1858. Vol. II, p. 304.

† *Rapport au Conseil de Santé des Armeés sur les Résultats du Service Médico-Chirurgical aux Ambulances de Crimée et aux Hópitaux Militaires Français en Turquie pendant la Campagne d'Orient en* 1854, 1855, 1856. Par J. C. CHENU, D. M., Médecin Principal, Bibliothécaire de l'École Impériale de Médecine Militaire, Officier de la Légion d Honneur, etc Paris: Victor Masson et Fils, 1865. Quarto, p. 145.

‡ *Statistique Médico-Chirurgicale de la Campagne d'Italie en* 1859 *et* 1860. Par le Dr. J. C. CHENU, Médecin Principal d'Armée en retraite, etc., etc. Paris: 1869, T. II, 447.

Wounds of the Ear.—The abstracts of face injuries selected comprise few of the ear. The wounds of the auricle were either infrequent or else regarded as of insufficient importance to be particularized. In the few cases in which any details were given, where the yellow cartilage and ligaments of the pinna were torn by musket balls or divided by sword-cuts, the parts were plastered together, sutures being used sometimes, and the dressing was completed by lint compresses, with cerate or warm fomentations, and a roller bandage. The results were generally unfavorable, the injured tissues, in a few days, sloughing away. Nearly all of the reported injuries of the middle and internal ear have been considered in connection with the head injuries. One of the most interesting is that recorded on p. 175 (*ante*), of Major Simms, who, at the Wilderness, was struck by a conoidal ball, which buried itself in the petrous bone. Seven years subsequently, the Pension Board, in New York, furnished the following additional particulars in the case:

"Examining Board, New York, March 22d, 1871. Report ball entered petrous portion of left temporal bone. There is now an opening one-half inch in diameter, two and one-half inches in depth, forward and inward, and connecting with the ear. The tympanum has been destroyed. The symptoms of cerebro-spinal lesion are complete. Paralysis and partial atrophy of muscles supplied by the left facial nerve. Complete deafness in the left ear, partial blindness in the left eye, and anæsthesia of the integument of the left side of the head and face. There is also partial paralysis of the right arm and leg, but no implication of sensation in those parts; certain muscles in the right leg have become shortened, producing deformity of the right foot. The opthalmoscope reveals degeneration of the left optic disc. These symptoms are due to a circumscribed inflammation of the base of the brain, results of the above-described wound. The disability will steadily progress, and, in time, destroy his life. Disability total, second grade ($20 per month). Permanent, and will increase; he has been in his present condition since January, 1866.

In February, 1872, I examined this officer, who then had partial right hemiplegia, with facial paralysis on the left side. There was a deep cavity communicating with the left petrous bone, the orifice closed by a rubber obturator, devised by one of the ingenious aurists of Philadelphia or New York. Puriform discharge and exfoliation of the cancellous structure of the temporal persisted, and the diagnosis and prognosis of the examining board was reluctantly verified.

Baron Larrey[1] and Dr. Hennen,[2] have sanctioned the belief that the auricle may be nearly torn off, and yet be made to re-unite. Dr. Nathan R. Smith holds the same opinion,[3] and describes the proper mode of promoting adhesion by using sutures of the integument on either side, sparing the cartilage, a precept disregarded by Leschevin[4] and Verduc,[5] but inculcated by the ancients. Paré and Hildanus and other authors of the time when sabre-cuts of the external ear were common, and ablation of the ear as a punishment not infrequent, recite instances of adhesion of the auricle after its complete detachment, and give minute instructions as to dressing such wounds. Such instances are not recorded in the returns we are considering. The rule to cleanse, replace, and keep in apposition by sutures and adhesive plasters all lacerated portions of the ears, nose or integuments of the face is as absolute in military as in civil surgery, and, as Mr. Coote observes,[6] some unpromising cases terminate with comparatively slight deformity. After all, the loss of the external ear in man, however unsightly, impairs the hearing but little. Seven instances are found in the records where the auricle was carried away by large projectiles,—either cannon shot, or shell-fragments, or grape, and two cases where great

[1] D. J. Larrey, *Clin. Chir., ed. cit.* T. V., p. 61, and *Mém. de Chir. Mil.* 1817, T. IV, p. 239.
[2] John Hennen. *Op. cit.* 3d ed. p. 353.
[3] See his *Supplement to a Translation of Saissy's Work on Diseases of the External Ear.* Baltimore, 1829, p. 206.
[4] Leschevin, *Mém. pour les Prix de l'Acad. de Chir.* Paris, 1819. T. IV. p. 85.
[5] Verduc. *Abrégé de la Chir. de Guy de Chauliac.* Paris, 1740.
[6] Holmes. *Syst. of Surg.* 2d ed. Vol. II, p. 420.

mutilation of the external ear was produced by musket balls. Of these nine patients, six were returned to duty, with the sense of hearing believed to be as acute as ever, and as the three who were discharged cannot be traced on the pension rolls, it is probable that their disabilities were not serious.* This series of observations should set at rest the question—if it remain a question in the mind of any experienced military surgeon or officer of ordnance—of the "windage" of balls. Rupture of the membrane of the tympanum from propinquity to artillery fire was frequent. The precautions enjoined by the gunners in the navy, in serving heavy ordnance, were not always observed in the army. The proportion of cases of deafness among the officers of the artillery arm, as well as among the cannoniers, has been, since the war, a frequent subject of remark.

Wounds of the Orbital Region.—Many examples of injuries of the superciliary region and of the frontal sinuses have been cited in the chapter on wounds of the head, and on page 325, and succeeding pages, are grouped thirty-nine cases of wounds of the malar and infraorbital regions, involving both eyes. These are followed by a long series in which a single eye or its orbit was implicated. The sad series of destruction of both eyes by small projectiles gave a mortality-rate of 27.8, only. In addition to the two instances of recovery, after balls had passed from side to side behind the orbital foramina, dividing, no doubt, the optic nerves, was that of a general officer, wounded at Gettysburg, whose case was not reported in detail. There was less of suppuration and necrosis in these three than in much less formidable cases, and the cicatrices remained firm and sound, with no consecutive disease of the surrounding tissues, although so many of importance were implicated. The returns furnish many abstracts that might greatly interest students of ophthalmology could they be reported with minuteness; but the duties of the reporters forbade them to give those precise details which give value to such observations. Of gunshot wounds of a single eye, there were twenty-six, in which it was requisite to extract balls or fragments of bone, and it was found well to interfere unhesitatingly when the lodgement of foreign bodies in the orbit was suspected. Extirpation of the globe was called for in two instances. A loss of the senses of smelling or hearing was observed in six of the cases of recovery selected for publication. There was a special hospital for the treatment of wounds and diseases of the eye established during the war, under the charge

* Consult further on the effect on hearing of loss of the auricle, Wepfer, *Ueber das schwere Gehör*, Leipzig, 1794, p. 19; J. F. Meckel, *Handbuch der Pathologischen Anatomie*, B. I, p. 400, Leipzig, 1812; Fritelli, *Orteschi Giorn. di Med.* T. III, p. 80; Oberteuffer in *Stark's Neues Archiv.* B. II, p. 638, and Mr. Darwin, *Descent of Man*, Vol. I, p. 12. Itard, *Traité des Maladies de l'Oreille et de l'Audition*, Paris, 1842, says that "everything combines to show that the auricle is absolutely useless in man; that the hearing is not altered when it is removed, I have had occasion to assure myself most positively." Valsalva (*De aure humana tractatus*, Bologne, 1703) and Haller (*Disputationes anatomicæ*) and Leschevin (*Prix de l'Acad.*, T. IV, p. 87) express an opposite opinion; but adduce no evidence in support of their assertions. Wilde, *On Aural Surgery* (*Am. ed.* 1853, p. 164); Kramer, *Handbuch der Ohrenheilkunde*, Berlin, 1867; Pilcher, *Treatise on the Ear* (*Am. ed., Phila.*, 1843, p. 41), say nothing to controvert Itard's doctrine. Toynbee (*Diseases of the Ear*, London, 1868, p. 12) remarks that in the recorded cases of diminished hearing from wounds of the auricle alone, no accurate acoustic tests were employed, and he gives a carefully observed case of a sailor, whose external ear was bitten off without any impairment of hearing. Consult further on this subject: Wright, *Varieties of Deafness*, London, 1829, p. 8; Erhard, *On Examination of the Ear with Reference to Soldiers and Medico-Legal Questions*, translated from *Wien. Wochenschrift*, 1864, pp. 730, 761, and *Brauchbare Hörohre, Berl. Klin. Wochenschrift*; Thomson, A., *Edinburgh Jour. of Med. Sci.*, 1847; Moos, *Ueber das Subjective Hören wirklicher musikalischer Töne, Virchow's Archiv.*, XXXIX, 2, p. 280; Agnew, C. R., *Sinus through Mastoid from Old Otitis Media, Transactions of the American Otological Society*, Boston, 1870; Lucæ, *Ueber eine Neue Methode zur Untersuchung des Gehörorgans zu Physiologischen and Diagnostichen Zwecken*, in *Arch. für Ohrenheilkunde*, III, 2, No. 3, p. 186; Roosa, D. B., in *Trans. Am. Otol. Society*, Boston, 1870, and *Am. Jour. Med. Sci.*, April, 1871; Pagenstecher, *On Trephining the Mastoid Process and Petrous Bone, Arch. f. Klin. Chir.* IV, S. 523, 1864; Colles, W., *Dublin Quart. Jour. of Med.*, No. 99, p. 32; Follin, *Gaz. des Hóp.*, 1864, p. 4; Eustachius, B., *Tab. Anatomicæ Cur.* Lancisii, Amsterdam, 1722; Curtis, *Present State of Aural Surgery, etc.*, 2d ed. London, 1841; Harvey, *The Ear in Health and Disease, with Practical Remarks on the Prevention and Treatment of Deafness*, London, 1865; Turnbull, *Clinical Manual of Diseases of the Ear*, Phila., 1872; A. Bérard, *Dict. de Méd. ou Rep. Gén. des Sci. Méd.* 2me ed. Paris, 1840, T. XXII, p. 350; Cassebohm, *Dissertationes de aure interna*, Francfort, 1730; Casserius, *De vocis auditusque organis historia anatomica*, Ferraria, 1600–'01; Cotunnius, *De aquæductibus auris humanæ internæ*, Neapol., 1760; Tröltsch, *Diseases of the Ear, their Diagnosis and Treatment*, New York, 1864, Gruber, *Lehrbuch der Ohrenheilkunde*, Wien, 1870; Fano, *Traité élémentaire de Chirurgie*, Paris, 1869, T. I, p. 737, devotes a large sub-chapter to wounds of the membrane of the drum; Neill, *A Report upon Deafness*, Liverpool, 1840.

of Surgeon Joseph H. Hildreth, U. S. V., and special wards were assigned for this purpose in several of the larger general hospitals.* An hospital steward, long on duty in this office, who lost an eye at Gettysburg,† has observed, with natural interest, the remote effects of the destruction of the globe of the eye by musket or pistol balls, in the numerous pensioners who visit the Army Medical Museum. In all who wore glass eyes, there was a shrinkage of the soft tissues of the orbit, which called for the replacement of the artificial eye by a larger disk. In about half of the cases, the enamel substitute followed the movements of the globe of the remaining eye. It was found unwise to wear the artificial eye more than eight of the twenty-four hours of the day, and the uninjured eye had to be treated tenderly, becoming irritated readily from slight causes. There was a case of a punctured wound of the eye, which came under my observation, November, 1861, that of Corporal Levi Brizzee, Co. C, 27th Massachusetts Volunteers. Entering a small "wedge tent," from the bright light outside, he walked upon a stack of muskets, and the point of a bayonet entered the lower part of the right cornea, producing a laceration of the iris, with protrusion. He was brought immediately to the regimental hospital, a few yards distant. The anterior chamber was filled with blood, and the condition of the interior of the eye could, therefore, not be discerned. With a probe, I raised the corneal flap, and replaced the prolapsed iris, dressing as after an operation for extraction of cataract,—borrowing an hair pillow, to elevate the head, from the neighboring general hospital. Without other treatment than a severely restricted diet this man recovered, and his vision was unimpaired. On the third day, I removed the occlusive dressing, and found the anterior chamber free from blood, and the cicatrization of the iris progressing favorably. In three weeks the patient returned to duty with less opacity of the cornea than is usually seen after cataract operations. Subsequently, I frequently met him on the field, and was astonished at the absence of even the power of accommodation in the injured eye. He told me that he always aimed with that eye. There was slight distortion of the pupil, and a leucomatous streak at the outer margin of the cornea; but I could not discover any impairment of vision. I endeavored to trace the history of this remarkable injury; but the man was made prisoner in the action at Drury's Bluff, May 16th, 1864, and, escaping from the military prison at Macon, Georgia, rejoined his regiment in North Carolina, and I did not see him again. He died of pernicious intermittent fever, at his home in Massachusetts, while on furlough, April 15th, 1865. In searching the records, I have not found examples of wounds of the lachrymal glands distinct from general destruction of the contents of the orbit. Those reported by Ravaton[1] and Larrey[2] appear to remain the only recorded instances.

Wounds of the Nose.—The few cases reported in detail of wounds of the nasal region were those in which some attempt at reparation or restoration had been made. On page 322 several cases of sabre cuts of the nose are enumerated, and illustrations of gunshot wounds of the nose are given on page 358. In incised and lacerated wounds of

* The ophthalmoscope was not used in the field hospitals of the Union or Southern armies, so far as can be learned. But in the recent Prussian-French War, we learn from Dr. L. Vaslin's *Études sur les Plaies par Armes a Feu, Paris*, 1872, p. 203, *et seq.*, that Dr. Galezowski was able to determine the existence of subchoroidean effusions and of lacerations of the choroid by *contrecoup*. These refinements, like that of detecting a cherry-stone in the œsophagus by percussion, are not of practical utility.

† Being shot through the descending colon and left popliteal space as well, and having, after eight years, a fistula in the lumbar region and false anchylosis of the knee.

[1] *Op. cit.* p. 175. [2] *Clin. Chir.* T. 1, 396. Remarkable examples of foreign bodies lodged for many years in the orbit, are recorded by Dr. Galezowski, *Traité de Maladies des Yeux, Paris*, 1872, p. 815, and by M. Demarquay, *Mém. sur les Corps étrang. arrêtés dans l' Orbite*, L'Union Méd. 1859, pp. 82, 123.

the cartilaginous portion of the nose the parts were secured in position by adhesive strips, and by placing in the nostrils bits of gum catheter plugged about with sponge or lint, to preserve, as much as practicable, the proper configuration of the organ, and to avert the contraction of the nasal passages and depression of the nose, which give, in some instances, such an unpleasant resemblance to the results of tertiary syphilis.* In these lamentable cases, surgery has little aid to afford. As has been seen in Section III (*ante* p 368), something may be sometimes accomplished by plastic procedures. Again, the deformity may be masked by an artificial nose of wax or gutta percha.† When the nasal and spongy bones were destroyed the condition of the sufferers was yet more cruel. In all of the cases that I have examined or enquired into, there was no cessation in gradual exfoliation and fœtid discharge into the nares, even after six or eight years. The patients thus suffered ill-health because of the local lesions, and mental distress from feeling that their injuries rendered them repulsive. Such cases appeal to our warmest commiseration.

Wounds of the Cheek.—Examples of punctured wounds by the bayonet, and of incised wounds by the sabre have been cited on page 323. The latter presented a frightful appearance sometimes; but usually healed readily under the judicious use of adhesive strips and sutures, with support from bandages. The cheeks were often badly torn by gunshot projectiles, and ugly cicatrices were left; but in the majority of cases the missiles penetrated or perforated the buccal cavity, often implicating the teeth or jaws. Of wounds involving the soft parts only, the most interesting were those in which the division of the parotid duct resulted in salivary fistula. Dr. John Thomson (*Report after Waterloo*), met several cases of this sort, and regarded them as very difficult to cure, and generally incurable; but I had one case under my immediate care, of an incised wound of the anterior part of the right duct of Steno, in which the fistula closed in about eight weeks. The treatment consisted in introducing a probe daily into the orifice of the duct, opposite the second molar, and occasionally cauterizing the external wound and applying constantly an occlusive dressing with collodion. In this instance, the continuity of the duct was preserved, and, after recovery, the saliva might be seen to trickle from the buccal orifice of the duct. Other successful cases are reported, two of which are noted on page 380. Some valuable observations on this subject are to be found in the Memoirs of the French Academy of Surgery.‡ Many instances are reported where wounds of the portio dura of the seventh pair, or branches of the fifth pair, caused various paralyses or nervous twitchings, or tics in the muscles of the face. Several examples will be found in the preceding pages, and others are detailed at length in the dissertation already alluded to, on gunshot wounds and injuries of the nerves, by Drs. Mitchell, Morehouse, and Keen. These careful observations, made at the military hospital at Christian Street, Philadelphia, illustrate the utility of electric currents in the treatment of such cases, besides affording interesting physiological and clinical studies.

* There have been not a few instances of discharged soldiers who have relinquished humble positions under Government, and of officers who have gone into retirement on account of their sensitiveness regarding disfigurements after wounds of the nose, that were ascribed by the ignorant and uncharitable to combats under the inspiration, not of Mars, but of Venus.

† On wounds of the nose consult Baudens, *Clin. des Plaies d'Armes à Feu*, Paris, 1836, p. 173; D. J. Larrey, *Mém. de Chir. Mil.*, Paris, 1817 T. IV, pp. 21 and 211; Garengeot, *Traité d'Op.*, T. III, p. 55. Fioraventi, Dionis, Mollinelli, Bridenbach, Louvet, Barthélemy, Carlizzi, Blegny, Leyser, and Hoffacker, have reported instances of adhesion after entire detachment of the cartilaginous part of the nose; Gauvin, *Thèse de Paris*, No. 232, 1865, p. 35; Jamain, *Path. Chir.*, T. I, p. 677; Denonvillers et Gosselin, *Comp. de Chir. Prat.*, T. III, p. 23.

‡ *Mémoires de l'Académie Royale de Chirurgie*, Paris, 4to, 1757, T. III, p. 431, *et seq.*: Duphenix, Morand, and Louis, in their several dissertations relate many personal observations respecting wounds of the salivary canals, and cite from Paré (*Book* 10, *ch.* 26), Fabrichs of Aquapendente (*De Vuln. particul.*), Munnicks (*Prax. Chirurg.*, Lib. 2, c. 16), Roonhuis, Beaupré, Vanderwiel (*Obs. rar.*, T. 2), Morgagni (*Advers. Anatom.* VI), Regnier de Graaf and Verrheyen, and many others important facts respecting this form of injury. See also Legouest, *l. c.* p. 382.

It is well known that Larrey[1] recommended, in accordance with the precepts of Desault,[2] to unite all gunshot wounds of the soft parts of the face by sutures, having first pared or "refreshed" the contused borders. Surgeon J. J. Chisholm,[3] P. A. C. S., sought to generalize this method, and a circular letter was issued by the Confederate Surgeon General, calling for reports on the subject. Surgeon Middleton Michel, P. A. C. S., published[4] a paper on the subject, with cases designed to prove the efficacy of the method. I will here only say briefly, that the evidence adduced was inconclusive, and that I fully agree with M. Legouest,[5] that Larrey's advice should not be followed in gunshot wounds of the face, since the slighter cases, and even those in which the cheeks are perforated, or the lips divided, generally healed readily, while the extended lacerations were commonly followed by swelling and elimination of the mortified parts; and by regulating such wounds by the knife, there was great liability of sacrificing more tissue than nature would have done.

Wounds of the Upper Jaw.—The returns of these injuries presented a larger proportionate fatality than the observations of European surgeons would have lead us to anticipate. Our reports indicated that the patients who escaped the immediate dangers of hæmorrhage, either primary or consecutive, had often to undergo such complications as erysipelas and pyæmia; while copious and protracted suppurations and the accidents pertaining to the ingestion of decomposed secretions into the digestive organs were other perils to be encountered. Dr. Chisholm (*op. cit.* 502) in the last edition of his manual for the use of the Confederate surgeons, published in the third year of the war, shares the opinions of Dr. Stromeyer (*op. cit.* p. 36) and of Matthews (*loc. cit.* p 305), and regards the accidents which follow, even very severe injuries of the facial bones, as comparatively slight. But the facts embodied in Table XIV compel one to dissent from this conclusion and to adopt rather the opinion of Guthrie (*op cit.* p. 524) that such wounds are often followed by "much suffering and by permanent inconvenience." In consulting the returns of the Pension Office, and in communicating with medical officers of extended experience, few examples of fair healing of gunshot wounds of the spongy bones forming the walls of the nasal cavities have been noted, though many pensioners with such injuries have now been upon the rolls or under observation for six or eight years since the reception of their injuries,—and to indicate how long such wounds may remain unhealed, I will here cite the case of a pensioner of the war of 1812, for which I am indebted to Dr. A. L. Lowell, of the Pension Bureau:

Case.—Private Noah Austin, of Captain Brown's Co., New York State Militia (*Pension Claim* No. 1700), was enlisted, August 30th, 1812, and was wounded at Queenstown on October 13th, 1812, and died on September 12th, 1870; the following are copies of the various surgical certificates in the case; 1st: "Gunshot wound received at the battle of Queenstown. A canister shot entered the face one and a half inches to the left of the nose, and still remains lodged in the bones of the face. There is an opening in the hard palate three-fourths of an inch in diameter, and there is a discharge through both wounds, but principally through the nose. His speech is affected and his general health is impaired. The disability is total." 2d: "A canister shot entered the face between the nose and the left cheek. The ball now remains in the cavity of the cheek, and still remains lodged in superior maxillary bones, from which constantly issues a fœtid discharge, and it totally disqualifies him for manual labor." 3d, *filed October 9th*, 1831: "External wound a little above alæ of nose, left side, on a line falling from inner canthus of left eye. The shot entered obliquely and probably lodged under the left malar bone. From a fistulous opening there is a constant discharge. The presence of the ball produces irritation and affects the health, so as to disqualify from manual labor." 4th, *filed September 3d*, 1839: "Gunshot wound of the head; ball still remains lodged in the head, causing constant

[1] *Clin. Chir.*, T. II, p. 3.
[2] Desault, *Oeuvres Chirurg.*, 3d ed. Paris, 1813, T II.
[3] Chisholm, *op. cit.*
[4] *Richmond Med. Jour.*, 1866, Vol I, p. 448.
[5] *Op. cit.* p. 385.

discharge from the nostrils. The shot has changed position since 1833. Disability increased." 5th, *filed March 26th*, 1850: "Canister shot in left cheek; constant pain and intense headache when stooping, and totally unfitting him for manual labor." 6th, *filed September 12th*, 1870: "The pensioner died from the effects of a gunshot wound of the head and face. For many years said wound kept up a constant discharge, and when he died the discharge had greatly increased, and just before he died, the ball passed into his mouth and was taken out by him, after it had destroyed the bony structures where it had been lodged. The immediate cause of death was pyæmia."

Balls lodged in the facial bones are, however, sometimes eliminated by the efforts of nature, as in the case of Private Williams, 5th Vermont, noted on page 342. The missile, a musket ball of ragged shape, had lain upon the left palatine bone from May 6th, 1864, until May 22d, 1868, when, according to the *Manchester Journal*, the patient, being aroused from his sleep by a sense of suffocation, with great pain extracted the projectile with his fingers through the soft palate. Yet the removal of the foreign body did not effect a cure, and the pensioner is still on the rolls.

To the many illustrations already adduced, may be added that of General Alexander Asboth, who was shot September, 1864, by a musket ball, at Marianna, Florida, the missile passing through the left antrum of Highmore, and lodging upon the palatine bone. The external wound healed; but there was profuse suppuration and interminable exfoliation through the posterior nares, and the general, already enfeebled by the effects of a gunshot fracture of the humerus, received at Pea Ridge, of a flesh-wound of the thigh, and several sabre wounds of the face, was steadily losing strength. After he had been a year or more under treatment, he visited Washington. There was a profuse purulent discharge into the fauces, and frequent exfoliations The ball was readily detected by passing the left index finger above the arch of the soft palate. Though he had resolved to submit to an extraction of the missile, his duties in connection with the mission to the Argentine Republic, with which he had been charged, were so urgent that he sailed without undergoing the operation. Suppuration and exfoliation continued, and the general died at Buenos Ayres, three years afterwards, from the effects of this wound. These instances, with the figures presented in the tables, may suffice to controvert the assertions of those military surgeons who regard gunshot wounds of the maxillary sinuses as comparatively trifling.

The more detailed abstracts reported indicate that in the treatment of wounds of the upper jaw, the practice of experienced surgeons, employed in the war, generally conformed to those simple lessons taught by the later preceding European campaigns, and confirmed by what we can learn of the surgical results of the wars of 1866 and 1870. Dr Chisholm (*l. c.*, p. 304) informs us of the usual course pursued by the Confederate medical officers:

"Unless the fragments are either completely detached or but slightly adherent, they should not be taken away, but should be replaced with care—as, in time, consolidation may take place, and very little permanent deformity will be left. Should some of these fragments die, they will be found loose, often as early as the sixth or eighth day, and should be removed. The cold-water dressings, with an occasional dose of salts to relieve the excessive swelling, is the only medication required. The wound in the face, after a careful adjustment of the movable fragments, should be closed with adhesive plaster, and, with the use of cold-water dressings for a few days, the case is left pretty much to nature."

To cleanse the wound, to remove detached fragments of bone, to replace and adjust undetached fragments, to suppress hæmorrhage; then to bring the soft parts as nearly in apposition as practicable, connecting them with adhesive straps, and dressing lightly with

compresses dipped in cold lotions, and supported by a bandage—such was the simple routine commonly observed by the Union surgeons, and with fair results usually; though much deformity was left in many cases, and the proportion of fatal results was not inconsiderable. Mr. Blenkins (*l. c.* p. 822) confirms the observation of Guthrie that, where the lachrymal bones or sac are wounded, the tears usually continue through life to overflow;—and Dr. Williamson (*op. cit.* p. 65) describing the invalided men from the Indian mutiny, speaks of the serious nature of gunshot wounds of the face and of the tediousness of their cure,—of the caries and necrosis and "profuse and very fœtid suppurative discharge"[1] that followed such injuries. Matthews, in his Crimean surgical report, expresses the belief that extensive necrosis rarely takes place in wounds of the facial bones; but it must be borne in mind that he had not the opportunity of following the ulterior histories of the cases he reports. In the footnote[2] is appended his view regarding the treatment of detached bone fragments and teeth. Mr. Matthews cites a case of grave secondary bleeding, in which the application of perchloride of iron proved successful; and Dr. Chisholm observes, in this connection, that "the iron styptic will control the most annoying hæmorrhage." The persulphate of iron in powder, and the perchloride in solution, were largely employed by the surgeons of the Union Army in hæmorrhages, both secondary and primary. These salts were placed in every hospital knapsack and in every hospital. Little evidence is adduced of their utility, though the suffering they caused to the patients is painfully conspicuous. In wounds of the upper jaws especially, they increased the inflammatory phenomena, and, moreover, converted the tissues into a blackened mass, in which the relations of parts could not be distinguished, and bleeding vessels could be properly secured by ligature only with the greatest difficulty. Such is my intense aversion to the employment of these styptics that I am not, on this point, an impartial judge, and will prefer to cite a very competent authority, Dr. Garretson:[3]

"Monsel's solutions, so warmly lauded for their styptic qualities, have exhibited to me more ill results than I have ever met with from any dozen other articles. If used at all, I think the bleeding points should be alone touched; but of one thing any one using them may be assured: if the application does not control the hæmorrhage instantly and permanently, he will have increased his trouble manifold."

Wounds of the Lower Jaw.—Guthrie remarks (*l. c.* p. 525) that these injuries "are perhaps more common, and are certainly more troublesome than those of the upper." The records we are considering indicate that the frequency of gunshot fractures of the lower maxilla is *thrice* that of similar injuries of the upper jaw-bones. Dupuytren declares (*l. c.* T. VI, p. 258) that the gunshot injuries of the lower jaw are far the most dangerous. The records show that in an aggregate of more than two thousand cases (see Table XII, p. 381) the ratio of mortality was nearly equal in the two classes of injuries: 8.1 per cent. for the upper, and 8.3 for the lower maxilla.[4]

[1] See Preparation 2955 of the Netley Museum.

[2] "There is, indeed, no great object beyond, perhaps, the present comfort of the patient to be attained in removing either fragments of bone or loosened teeth in the great majority of instances. If they die, they become loose, and are readily lifted away without trouble to the surgeon, and but little pain to the patient. This observation is specially applicable to fractures of the lower jaw. Surgeons in this [the Crimean] war have seen so many cases of badly-fractured instances of this kind unite, and that with a very small amount of deformity, that men of experience are now excessively chary of removing any portion of this bone, unless it has become dead, or the fragment is so situated as to interfere considerably with the adjustment of the remainder, or the bone so much comminuted as to give no probable hope of its becoming consolidated, or so sharply angular as to threaten further injury to the soft parts, or to interfere materially with their adjustment." *Op. cit.*, Vol. II. p. 305.

[3] Garretson, James E. A Treatise on the Diseases and Surgery of the Mouth, Jaws, and Associate Parts. Philadelphia, 1869, p. 474.

[4] Dupuytren fell into another error by reasoning deductively, and teaching that on account of the great density and hardness of the inferior maxilla, the resistance opposed by it, a shock to the cerebrum was often produced by the impact of balls, a species of *contrecoup*, causing cerebral commotion. His disciples, H. Larrey and Legouest, "find this an hard doctrine." There is nothing in the records we are examining to sanction it.

In the Confederate armies, some form of inter-dental splint was often employed in gunshot fractures of the lower jaw. An apparatus devised and successfully used in many unpromising cases by Dr. J. B. Bean, a dentist of Atlanta, Georgia, is praised highly by many of the Southern surgeons,[1] and forty or more examples of its useful application have been published. According to Dr. Chisholm (*l. c.* p. 305) the usual method of treating gunshot fractures of the lower jaw was that described in the footnote.[2]

As Malgaigne has remarked, in treating of fractures of the lower jaw, the "*fixation des dents*" dates from the time of Hippocrates; but every writer on minor surgery has his pet fixture. The evidence of the utility of Dr. Bean's apparatus, in cases in which its application was supervised by himself, is conclusive. Surgeon Philip S. Wales, U. S. N., some years ago contrived an apparatus, which, he tells us,[3] was used successfully in twelve cases of fractured lower jaw. As figured in his work, it is very trig and sailor-like, well fitted to fulfill the indications for maintaining fractures of the lower maxilla; but perhaps, like so many others, too complicated to meet the exigencies of field practice. In the Union armies, softened binders' board, secured by a four-tailed bandage, was the ordinary dressing. If there was much comminution, loose fragments were removed, and occasionally excisions were performed of portions of body or of the rami. In the base hospitals, complex apparatus of leather, gutta percha, papier maché, were employed, according to the prevailing fashion of the section of country in which the hospital was situated.[4] The experiment of wiring the fractured extremities of the maxilla, as proposed and practiced by Baudens, was occasionally employed; but Dr. Bentley and others report unfavorably of this method, and several examples of ununited fracture are recorded, in which it had been adopted, with the additional dressing of Barton's bandage. Wiring together the contiguous teeth was frequently yet not advantageously practiced. A pad of oakum under the cross-pieces of pasteboard was found convenient. Frequent detergent collutories, liquid food, and an antiphlogistic regimen were regarded as essential in the treatment. A solitary instance of fracture of the lower maxilla by a bayonet, is related on page 323. The fractures from falls and blows were not infrequent. In the Army Medical Museum, specimens of thirty-two gunshot fractures of the lower jaw may be found, exhibiting many varieties of union, partial reparation, caries, and necrosis.[5] A single additional illustration

[1] COVEY, *Richmond Med. and Surg. Jour.* Vol. I, p. 81; BOLTON, p. 318.

[2] "The surgeon accompanying the transports usually sends injuries of the face to the field infirmary untouched, or should the lower jaw be broken, applies a folded handkerchief or band under it to support it. This fracture is permanently put up at the field infirmary in a pasteboard splint, well padded with carded cotton, and secured by folded cloth or double-tailed bandage. One band passes over the vertex, supporting the jaws, while the other passes from the front of the chin behind the head, and then around the forehead, where it is secured by pins. Before the dressings are applied the wounds should have been examined carefully with the finger, and all perfectly detached spicula of bone should have been removed. From the excessive vascularity of all the tissues of this region the bones do not necrose as extensively as in other portions of the body, and portions of bone which are attached to the soft parts very often consolidate. The surgeon must be prepared to meet much swelling and profuse salivation. All gunshot injuries to the bones of the face being compound, suppuration is soon established, and the secretion of pus is copious. When the ball has perforated the buccal cavity, causing inflammation and salivation, it will add much to the comfort of the patient if his mouth be swabbed out daily with a piece of soft rag or sponge attached to a thin piece of wood. From the difficulty in swallowing, fluid nourishment must be prescribed. The constant thirst of those wounded will be relieved by small doses of morphine, or by acidulated drinks, made either with diluted nitric acid or vinegar. Injuries about the face are very liable to erysipelatous attacks, which, however, are readily controlled by the free use of the muriated tincture of iron,—thirty drops every three hours often checking the progress of the disease by the end of the first day of treatment.'

[3] WALES, *Practical Treatise on Surgical Apparatus, Appliances, and Elementary Operations.* Philadelphia, 1867, p. 384.

[4] It would be superfluous to enumerate the different splints, bandages, and complicated dental, inter-dental and submental contrivances that were occasionally employed at the general hospitals in the treatment of fractures of the lower jaw. Barton's and Gibson's methods of bandaging were frequently employed (E. WARREN, *op. cit.* p. 364). A few examples are noted of the application of the apparatus of Dr. Garretson (*loc. cit.* p. 518), of Mr. Nasmyth, and of Dr. Gunning; still fewer of the cork splint of Boyer, and Mitter's silver clasp. Startin's wire splint, Lonsdale's clamp, and Hamilton's apparatus were employed, each in a single case, with satisfactory results. There are indications in the reports that the medical officers were not ignorant of the methods of dressing devised by Rutenick, Salicet, Jousset, Bush, Hartig and Houselot, Kluge and Malgaigne, but they found the simplest dressings the best for field service.

[5] See *Photograph* 326, *Surgical Series*, for Dr. Hewit's remarkable specimen of reparation of the body of the inferior maxilla after a gunshot injury nearly destroying the lower jaw, reported on page 356. It was impracticable to get a wood-cut of this interesting preparation in season for the press. Excellent illustrations of united simple fractures of the body and the rami of the lower jaw are afforded by specimens 5146, 5149, 5147;—and specimens 5151 and 5148 exhibit the effects of caries and necrosis following injury.

may be cited, as it relates to the next subject to be considered. Recurring secondary hæmorrhage, probably from the lingual artery, was unsuccessfully treated by ligating the common carotid.

FIG. 176.—Gunshot fracture of the body of the lower jaw. *Spec.* 3542, A. M. M.

CASE.—Private G. T———, Co C, 82d Pennsylvania Volunteers, aged 22 years, was wounded at Spottsylvania, May 10th, 1864, by a bullet, which entered the left side of the face, one inch anterior to the angle of the inferior maxilla, and comminuting its body, passed through the tongue inferiorly, and escaped two inches posterior to the symphysis of the right side. He was sent to Washington, and admitted to Douglas Hospital on the 25th. The tongue was so swollen as to project from the mouth, and render articulation and deglutition almost impossible. The patient was nourished with milk and beef-essence, which were injected into the œsophagus. Secondary hæmorrhage, to the extent of twelve ounces, occurred on June 2d, requiring the ligation of the left primitive carotid. The internal jugular vein was also tied, having been nicked during the operation. On the 3d, a slight return of hæmorrhage to the extent of two ounces took place, and death soon followed from exhaustion. The fractured maxilla is shown in the adjoining cut. It was contributed to the Army Medical Museum by Assistant Surgeon W. Thomson, U. S. A., and is No. 3542 of the Surgical Section.

WOUNDS OF THE BUCCAL CAVITY.—In the abstracts selected to illustrate the face wounds, many instances of lesions of the buccal cavity may be noted Most of the gunshot injuries of the jaws were of this class Wounds complicated by lesions of the tongue, epiglottis, soft-palate, or glands of the mouth, or by the evulsion of several teeth were serious and very painful. Percy (*l. c.* p. 116) cites from Bartholin, Mangetus, and Paré examples of balls lodged from three to six years in the tongue. I have not observed any such instances in the records. The reader will not overlook the case of Jeffery (p. 357), where the wounded tongue contracted adhesions with the jaw,—or the cases of Lynn (p. 350), Schwartzlander (p. 355), and Stewart (p. 364),—all presenting remarkable complications of gunshot wounds of the tongue. In many of the wounds involving the alveolar processes and palatine arch, the aid of skilful dentists was sought advantageously.

HÆMORRHAGE IN WOUNDS OF THE FACE —We can here consider the means adopted to suppress hæmorrhage after wounds of the face, and more particularly after gunshot fractures of the facial bones. Unless some large arterial trunk was implicated, primary bleeding, that could not be controlled by judicious compression and cold applications, was rarely observed; but the secondary hæmorrhages following gunshot wounds of the facial bones were frequent and very dangerous. The abuse of styptics in this class of cases has been already adverted to. The profuse distribution of powders of persulphate and solutions of perchloride of iron in the field-case, paniers, knapsacks, and dispensaries appeared to invite ignorant orderlies or stewards to stuff every bleeding wound with lint or charpie saturated with undiluted solutions of these corrosive salts. The rule that the use of styptics,—other than cold, compression and position,—should be restricted within the narrowest limits, is nowhere more strictly applicable than in wounds of the face.

Detailed abstracts have been given of the cases of Amos (p. 332), Martin (p. 339), Baine (p. 346), Beamenderfer and Cox (p. 347), Heiser (p. 349), Kilburn (p. 350), Merchant, McIlroy, Murray, and McInnis (p. 351), Maley (p. 352), Reeves and John R—— (p. 353), Stienberger (p. 355), and G. T—— (p. 392). And here may be introduced particulars regarding three other ligations of the common carotid, which are illustrated by preparations in the Army Medical Museum.

CASE.—Sergeant Lyman A. P———, Co. D, 8th New York Heavy Artillery, aged 21 years, was wounded at Ream's Station, August 25th, 1864, by a musket ball, which entered over the right mastoid process, injured the external ear, and lodged under the skin, a little in front of the auditory foramen. In the difficult retreat from Ream's Station, he was conveyed to the Base Hospital at City Point, and thence was sent to Washington and admitted to the Lincoln Hospital, on August 28th. The ball had not been extracted, and no symptoms attracted special attention until September 7th, when Acting Assistant Surgeon A. M. Sherman, in charge of the case, observed that the right parotid gland was so greatly inflamed that the patient with difficulty separated his teeth more than one-fourth of an inch. In the course of the day, he had an alarming hæmorrhage, supposed to proceed from the posterior auricular. This was stopped by compression with lint steeped with solution of persulphate of iron. On September 8th, there was no recurrence of bleeding; on the forenoon of the 9th, he had an alarming hæmorrhage, which was temporarily arrested, with difficulty, by compression with lint and styptics, until the patient could be removed to the operating room, when the right primitive carotid was ligated by Acting Assistant Surgeon W. W. Valk, the patient being etherized. The ligature was placed a short distance below the bifurcation, and coagula were removed, and the ball, already mentioned, was extracted from near the angle of the jaw. On the 10th, the patient was quiet, with a frequent pulse; on the 11th, bleeding recurred, and again on the 12th, but ceased spontaneously. There was diarrhœa and vomiting. On the 14th and 15th, the symptoms were regarded by Dr. Sherman as favorable. On the 18th, there were several recurrences of hæmorrhage; on the 19th, there was much swelling of the face and neck, when the ligature was removed. The patient died from hæmorrhage on the following day. The following is an abstract of the notes made at the autopsy, by Acting Assistant Surgeon H. M. Dean: "Height, five feet seven inches. * * * * The submaxillary gland was in a suppurating condition; * * the jugular vein was perfectly normal; there was an abscess extending above and below the point of the artery ligated about three-fourths of an inch; the ligature had come away, and the two extremities of the artery, at the point of ligation, were covered with pus." The wound already adverted to, behind the right ear, was connected with an abscess, which extended down to the angle of the inferior maxilla, and contained a dark-colored fœtid pus. The artery from which the hæmorrhage came was not detected. The case is reported by Drs. Sherman and Dean, and Surgeon McKee, in his quarterly report, gives no further remarks on the case by Dr. Valk. The pathological specimen, figured in the wood-cut, shows one-third of the calibre of the vessel undivided. In the wood-cut (FIG. 177), the ligature on the internal carotid was apparently, as Dr. Woodhull has remarked, an experiment upon the cadaver.

FIG. 177.–Innominata, portion of subclavian and three carotids, showing division by ulceration on the tenth day after ligation of the common carotid. *Spec.* 3252, Sect. I, A. M. M.

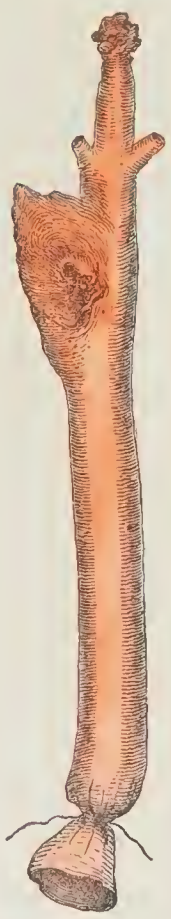

FIG. 178.—Ligation of right carotid. *Spec.* 2133, Sect. I, A. M. M.

CASE.—Private P. O'C———, Co. H, 18th U. S. Infantry, was wounded at Chickamauga, September 20th, 1863, by a conoidal ball, which entered below the left zygomatic arch, passed through to the right side, and made its exit below the angle of the inferior maxilla. Secondary hæmorrhage occurred from the wound of exit and from the mouth on October 2d, but it was temporarily checked by compresses. October 4th, Surgeon Peter H. Cleary, U. S. V., ligated the external carotid. The patient improved rapidly and appeared perfectly safe, when, on October 12th, hæmorrhage recurred; but was again checked by compression. The wounds were nearly healed, but the patient was greatly enfeebled from repeated loss of blood. On October 23d, a profuse hæmorrhage set in from the wound of exit. Surgeon I. Moses, U. S. V., then ligated the right common carotid, about one and a half inches above its origin. The patient sank rapidly, and died on October 25th, 1863. The preparation, forwarded to the Museum by Dr. Moses, U. S. V., is represented in the wood-cut (FIG. 178). It shows a ligature of the common trunk, and, at the bifurcation, a large coagulum is imperfectly indicated. Above are the origins of the occipital and facial arteries, and, at the extremity, the rugose ulcerated section of the external carotid.

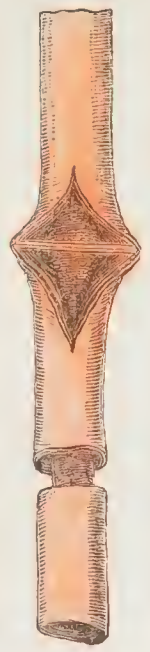

FIG. 179.–Obtunding coagulum in the primary carotid. *Spec.* 3409, Sec. I, A. M. M.

CASE.—Corporal G. P———, Co. H, 91st Pennsylvania Volunteers, aged 28 years, was admitted to Emory Hospital, Washington, October 31st, 1864, for a gunshot wound of the face, received near South Side Railroad, Virginia, October 27th. A ball had entered the chin at the left side, passed inward and lodged beneath the angle of the inferior maxilla, whence it was extracted through the mouth. The wound was dressed with cold water, and a compress was applied to the jaw. On November 4th, secondary hæmorrhage occurred, which was arrested by plugging the wound with sponges. The common carotid artery was tied in the continuity, just above the omo-hyoid, by Surgeon N. R. Mosely, U. S. V., for recurring hæmorrhage on the 6th, and the patient died from exhaustion on the evening of November 16th, 1864. The *post-mortem* examination revealed a firm clot in the artery. A wet preparation, showing the extent of this formation, was contributed to the Army Medical Museum by Acting Assistant Surgeon W. H. Coombs, and is represented in the adjoining wood-cut (FIG. 179).

In TABLE XV, fifty-four cases of ligation of the common carotid after gunshot wounds of the face are accounted for, including two instances in which the external carotid was also tied. Nineteen cases have been recited, with such particulars as were communicated. The remaining thirty-five must be consolidated in a tabular statement.

The limited space afforded by the arrangement of the table enables me to add a few particulars respecting some of the cases already briefly referred to. Dr. T. R. Crosby's patient (Ames, p. 332,—misspelled *Amos* on some of the reports), in 1870, five years after the operation, was, as reported by Drs. W. Craig and C. R. Porter, of Albany, totally disabled by the impairment of vision in the remaining eye. Dr. J. H. Coover's case (Martin, p. 339) was a secondary one, the operation being performed on the fifty-second day; the patient lived thirty-eight days afterward, or ninety days after receiving the wound. Lieut. Maley's was also a secondary case. He was in tolerably good health in August, 1868. The operations in the four remaining cases of recovery were intermediary, having been performed on the 4th, 5th, 6th, and 11th days, respectively.

Tabular Statement of Thirty-five Ligations of the Common Carotid Artery for Gunshot Injuries of the Face.

No.	NAME AND MIL. DES.	INJURY.	LIGATION.	DATE OF WOUND.	DATE OF HÆMORR'AGE.	DATE OF OPERATION.	RESULT.		REMARKS.
							RECOVERY.	DEATH.	
1	*Beard, J. J.*, Lieut., 19th Va. Cavalry.	G. S. F. of lower jaw.....	Common carotid, just below bifurcation.	Aug. 13, 1864	Aug. 21, 1864	Sept. 4, 1864	Recovered ...	.....	Operator, Surgeon W. S. Love, P. A. C. S.
2	Fugleson, C., Serg't, 4th Ohio.	G. S. W. of lower jaw.....	Right common carotid....	May 12, 1864	.....	June 25, 1864, July 1, 1864.	Oct. 30, 1864	.....	Operator, Surgeon D. W. Bliss, U. S. V. The facial artery was tied on May 12, 1864.
3	Higgins, Pat'k, Private, 56th New York.	G. S. F. of lower jaw, with wound of sublingual artery.	Right common carotid....	May 3, 1862	May 31, 1862	May 31, 1862	Sept. 4, 1862	.....	Operator, Surgeon Z. E. Bliss, U. S. V. Disability three-fourths and permanent, January, 1870.
4	Klingenberg, C., Private, 7th New York Artillery.	G. S. F. of lower jaw	Common carotid, just above omo-hyoid	June 3, 1864	.....	.....	Feb. 20, 1865	.....	Disability seven-eighths and permanent, April, 1867.
5	Reed, James, 13th Mass.....	Conoidal musket ball fracturing right upper maxilla.	Right common carotid....	Sept. 17, 1862	Sept. 25, 1862, recurred Nov. 14, 1862.	Sept. 28, 1862	Nov. 14, 1863	.....	Operator, Ass't Surgeon R. F. Weir, U. S. A.
6	R——, J. R. P., 30th Mass..	G. S. W. of mouth	Common carotid.....	Sept. 17, 1862	.....	.....	Recovered ...	.....	
7	Sandy, N. B., Private, 3d West Virginia.	G. S. F. of inferior maxilla.	Right common carotid....	Aug. 30, 1862	Sept. 6, 1862	Sept. 6, 1862	Oct. 10, 1862	.....	Operator, Assistant Surgeon Philip Adolphus, U. S. A.
8	Siggins, T., Lieut., 49th Mass.	G. S. F. of upper and lower jaw; sight of one eye destroyed.	Common carotid.....	May 27, 1863	June 16, 1863	June 16, 1863	Sept. 1, 1863	.....	Operator, Assistant Surgeon Francis C. Greene, 30th Massachusetts Volunteers. Disability one-half and permanent, March, 1864.
9	Salmon, G. A., Private, 27th Pennsylvania.	G. S. F. of inferior maxilla.	Right common carotid....	April 2, 1865	April 10, 1865	April 11, 1865	May 18, 1865	.....	
10	*Watts, W. W.*, Private, 6th South Carolina Cavalry.	G. S. W. of face.....	Common carotid.....	.....	.....	.....	Unknown.....	.....	
11	Ashley, J. J., Citizen.....	G. S. W. of left ear.....	Left common carotid, at lower triangle.	Oct. 16, 1864	Oct. 29, 1864	Oct. 29, 1864	.....	Nov. 2, 1864	Operator, Acting Ass't Surgeon N. A. Robbins.
12	*Bachus, J. W.*, Private, 12th Georgia.	G. S. W. of inferior maxilla, right side.	Right common carotid, under omo-hyoid.	July 9, 1864	July 19, 1864, recurred Aug. 27, 28, 29, and 30, 1864.	July 20, 1864, re-ligated Aug. 30, 1864.	.....	Sept. 1, 1864	Operator, Ass't Surgeon R. F. Weir, U. S. A.
13	Clark, J., Private, 57th Pennsylvania.	G. S. F. of upper jaw, right side.	Common carotid.....	Sept. 30, 1864	.....	Oct. 21, 1864	.....	Oct. 22, 1864	Operator, Acting Ass't Surgeon J. H. Packard.
14	Cronin, M., Private, 95th New York.	G. S. W. of right side of face.	Right common carotid, near bifurcation.	June 19, 1864	July 1, 1864	July 4, 1864, re-ligated July 6, 1864.	.....	July 6, 1864	

15	*C*——, *W. R.*, Private, 61st Alabama.	G. S.W. of left side of face.	Common carotid.....	Sept. 19, 1864	.....	Oct. 7. 1864, recurred same day.	.....	Oct. 8, 1864	Operator, Surgeon W. S. Love, P. A. C. S.
16	F——, A., Sergeant, Co. D, 11th Indiana.	G. S. W. of lower jaw....	Right common carotid....	June 24, 1864	July 8, 1864, recurred July 9, 1864.	July 8, 1864, re-ligated.	.....	July 10, 1864	(See *Catalogue of the Surg. Sect. of the Army Med. Mus.*, SPEC. Nos. 1635 and 1636. Washington, 1866.)
17	*Guthrie, W. F.*, Private, 38th Virginia.	G. S. W. of face.....	Common carotid.....	May 16, 1864	June 19 and 22, 1864.	June 23, 1864	.....	June 25, 1864	
18	*Houston. T. C.*, Private, 2d Alabama.	G.S.F. of right malar bone.	Right common carotid, above omo-hyoid.	April 9, 1865	.....	May 7, 1865	.....	May 26, 1865	Operator, Surgeon A. McMahon, U. S. V.
19	*Hutts, M.*, Private, C. S. A...	G. S. W. of lower jaw....	Right common carotid....	.....	.....	June 7, 1863	.....	June 8, 1863	
20	Jones, E , Private, 29th Iowa.	G. S. F. of inferior maxilla, left side.	Left common carotid, in superior triangle.	July 4, 1863	July 18, 1863, recurred July 20 and 21.	July 18, 1863	.....	July 26, 1863	
21	*Jones, J. P.*, Private, 2d Miss.	G.S.F. of superior maxilla.	Common carotid.....	May 3, 1863	June 3, 5, and 7, 1863.	June 7, 1863	.....	June 7, 1863	
22	Jungk, J. G..Serg't, 46th N. Y.	G. S. F. of upper jaw.....	Common carotid.....	Sept. 30, 1864	Oct. 7, 1864	Oct. 7, 1864	.....	Oct. 12, 1864	Operator, Acting Ass't Surgeon G. A. Chesley.
23	*Lilly, E.F.*, Private, 8th Texas Cavalry.	G. S. W. of face.....	Right common carotid, in the inferior triangle.	May 9, 1864	May 16, 1864, recurred same day.	May 16, 1864	.....	May 16, 1864	
24	*McGuire, J. H.*, Private, 24th Mississippi.	G. S. W. of left mastoid process.	Common carotid, upper third.	Sept. 20, 1863	Oct. 10, 1863	Oct. 10, 1863	.....	Oct. 24, 1863	
25	Plaskett, J., Private, 120th N. York.	G. S. W. of mouth.....	Common carotid, just below bifurcation.	.....	.....	Sept. 19, 1864	.....	Oct. 6, 1864	Operator, Surg. W. B. Reynolds, 2d U. S. S. S.
26	Quick, J., Corp'l, 33th N.York	G. S. F. of lower jaw, left side.	Left common carotid, just above omo-hyoid.	Dec. 13, 1862	Dec. 25, 26, and 27, 1862.	Dec. 27, 1862	.....	Jan. 6, 1863	Operator, Acting Ass't Surgeon, H. N. Fisher.
27	Renwick, A. F., 16th Kentucky	G. S. W. of face.....	Left common carotid.....	June 2, 1864	June 17, 18, and 19, 1864.	June 19, 1864	.....	June 22, 1864	
28	Schlicher, J., Corporal, 20th Massachusetts.	G.S. F. of superior maxilla, left side.	Left common carotid, in lower part of anterior superior triangle.	July 1, 1863	July 8, 1863. recurred July 19, 1863.	July 16, 1863	.....	Aug. 26, 1863	Operator, Acting Ass't Surgeon W. W. Keen.
29	Sheppard, P., Private, 42d Indiana.	G. S. F. of right malar and inferior maxilla.	Right common carotid, in the inferior triangle.	Aug. 1, 1864	Aug. 29 and 30, 1864.	Aug. 30, 1864	.....	Aug. 30, 1864	Operator, Surgeon B. B. Breed, U. S. V.
30	S——, M., Private, 52d Pennsylvania.	G. S. W. of left side of face.	Left common carotid, just above omo-hyoid.	May 31, 1862	June 13 and 14, 1862, recurred June 22, 1862.	June 14, 1862	.....	June 24, 1862	Operator, Acting Assistant Surgeon David W. Cheever. (See *Cat. of the Surg. Sect. of the Army Med. Mus.*, SPE. 508, Washington, 1866.)
31	Schenck, W., Private, 119th New York.	G.S.F. of superior maxilla	Common carotid.....	June 15, 1864	July 6, 1864, recurred July 16, 1864.	July 10, 1864	.....	July 20, 1864	Operator, Acting Ass't Surgeon D. J. Griffith.
32	Trabey, H., Private, 5th Pennsylvania Cavalry.	G. S. flesh wound of face..	Common carotid.....	May 8, 1864	.....	June 27, 1864	.....	July 5, 1864	Operator, Ass't Surg. Warren Webster, U. S. A.
33	Theilman, H., Private, 15th New York Heavy Artillery.	G. S. W. of left side of face.	Left common carotid, at crossing of omo-hyoid muscle.	June 19, 1864	.....	July 6, 1864	.....	July 12, 1864	Operator, Acting Ass't Surgeon O. W. Peck.
34	Winter. F., Private. 3d Illinois Cavalry.	G. S. F. of upper and lower maxilla.	Left common carotid, just below bifurcation.	Aug. 21, 1864	Sept. 4, 1864	Sept. 6, 1864	.....	Sept. 8, 1864	Operator Acting Assistant Surgeon J. Z. Hall.
35	Ward, P. H., Private, 24th Wisconsin.	G. S. F. of inferior maxilla.	Common carotid.....	Dec. 30, 1862	.....	.....	.....	Jan. 15, 1863	

The results of ligation of the common carotid for gunshot injuries of the face were ascertained in fifty-three of the fifty-four cases reported. There were fifteen recoveries and thirty-eight deaths (or 71.7 *per cent.*) This mortality rate is larger, of course, than shown by the tabular statements of Dr. George Norris and others, for ligations of the carotid for all causes; but not excessive for a series of ligations of the carotid for injury. In thirty-seven cases the affected side was noted. The right carotid was tied in twenty, and the left in sixteen cases. In Case 30, reported by Dr. Cheever, the ligature being applied on the fourteenth day after the injury, the patient had recurrent hæmorrhages; but survived until the twenty-fourth day (Fig. 180). In the case of R. J. F——(p. 349), death occurred on the eighth day after the reception of the wound. The specimen is represented in the wood-cut, Fig. 181.

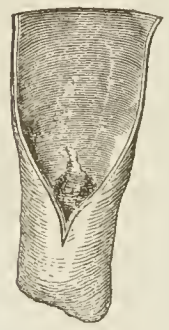

Fig. 180.—Clot in left primary carotid. *Spec.* 508, Sect. I, A. M. M.

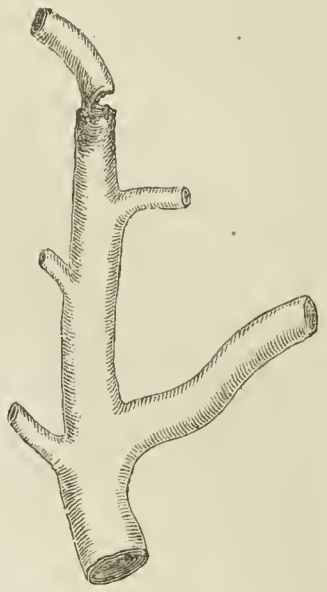

Fig. 181.—Partial division of the external carotid, near the origin of the internal maxillary. *Spec.* 2222, Sect. I, A. M. M.

Of the fifty-four ligations of the common carotid for gunshot face injuries, two were wounds of the soft parts only. The others involved fractures limited mainly to the mastoid or malar regions in nine instances, to the upper maxillary in twenty cases, to the lower maxilla in twenty-two cases, and extending to both jaws in three cases. The period intervening between the date of injury and the date of operation is known in forty-eight of the fifty-four cases cited, giving an average of eighteen days. The period between the date of operation and the date of death is recorded in thirty-seven of the thirty-eight fatal cases, averaging six days. The common carotid was re-ligated in four cases. In one instance (case of Fugleson, p. 394) the patient recovered; in the other three, the men died on the same, the first and second day, respectively.

There were six cases reported of ligations of the external carotid, in addition to the two already mentioned in conjunction with ligations of the common trunk. Four of the six may be regarded as successful, in the sense of recovery from the operation:

Bryant, W., Private, 17th Indiana Volunteers. Gunshot wound of inferior maxilla, June 25th, 1863. Hæmorrhage occurred July 5th, 1863. Ligation of external carotid, July 5th, 1863. Hæmorrhage recurred, and artery re-ligated, July 8th, 1863. Recovered August 30th, 1863. In October, 1867, his disability was rated total and permanent.

Diss, C., Private, 13th Ohio Volunteers. Gunshot fracture of right zygoma and malar bone; loss of eye, September 14th, 1862. Hæmorrhage from right external carotid occurred September 22d, 1862. Artery ligated September 22d, 1862. Recovered November 19th, 1862. September 4th, 1865, Pension Examiner Th. A. Reamy stated that the right eye is sympathetically affected, and that the patient's general system is failing rapidly. Pensioner died September 22d, 1865.

Godfrey, A., Private, 14th New York Heavy Artillery. Gunshot wound of the jaw, June 18th, 1864. Hæmorrhage occurred from the external carotid, June 27th. Artery ligated June 27th, 1864, by Surgeon G. L. Pancoast, U. S. V. Patient died June 30th, 1864.

Henderson, G., Sergeant, 7th Wisconsin Volunteers. Gunshot fracture of superior maxilla, September 14th, 1862. Hæmorrhage occurred from right external carotid, September 15th, 1862. Artery ligated September 15th. Recovered October 15th, 1862. In June, 1863, his disability was rated two-thirds and temporary.

Nelson, G. W., Private, 12th Georgia Regiment. Gunshot fracture of zygoma, June 6th, 1864. Hæmorrhage occurred from left external carotid, June 6th and 7th. Artery ligated June 7th. Hæmorrhage recurred June 19th. Died June 19th, 1864.

Thompson, L. C., Private, 1st Texas Regiment. Gunshot fracture of right inferior maxilla, December 14th, 1864. Hæmorrhage occurred from right external carotid, December 14th, 1864. Artery ligated December 14th, 1864, by Surgeon J. C. Jones, 4th Texas. Recovered January 14th, 1865.

A single instance is noted of ligation of the internal jugular for a wound made in extracting a ball lodged behind the great vessels:

CASE.—Private William McDonald, Co. F, 51st New York Volunteers, was wounded at New Berne, March 14th, 1862, by a musket ball, which entered the lower jaw, one and a half inches to the left of the symphysis, passed downward into the left side of the neck and lodged at the apex of the superior carotid triangle, between the jugular vein and the carotid artery. The hæmorrhage was severe. He was treated at the New Berne Hospital till April 14th, and thence transferred to New York, and sent to Bellevue Hospital. On May 8th, he was transferred to Ladies' Home Hospital. Loose pieces of bone were removed on June 15th, and, at subsequent periods, other fragments, in all amounting to sixteen. The wound finally healed, about September 15th. At that date, he suffered from numbness of left shoulder and partial paralysis of corresponding arm; he was unable to perform arduous duty, but was placed on light duty at the hospital. On January 5th, 1863, the bullet was removed by Surgeon Alexander B. Mott, U. S. V. In cutting down, over the ball, it was found that the relative anatomy of the part was deranged. The bullet was lying behind the deep jugular vein and carotid artery, and pressed the vein forward to such an extent that the vessel was collapsed and little or no blood could pass through it. The surrounding tissues also closely invested the missile. Although the incision was made through the sterno-cleido-mastoid muscle to the outside of the deep jugular vein, owing to the above facts it was accidentally wounded. The hæmorrhage, however, was inconsiderable, being controlled by pressure, the danger of cutting the vein, and the probability of the accident having been duly announced by the operator previous to the operation. The ball was extracted with some difficulty, and a double ligature passed around the vein so as to secure it above and below; the wound was drawn together by interrupted sutures and adhesive straps. The ball was flattened on the posterior aspect and was very jagged where it was in contact with the carotid artery. The wound healed kindly, the ligatures coming away on the ninth day after the operation. The patient was finally discharged from service on April 13th, 1863. Pension Examining Surgeon S. Gale reports, September 30th, 1868, that exfoliation is still progressing; difficulty of deglutition; left arm paralytic from probable injury of the cervical nerves.

No instances of ligations of the *internal* carotid for gunshot injuries of the head or face were reported. The examples of tying the facial, lingual, superior thyroid, and other minor branches were but few, and the particulars reported but scanty*. The following citations will indicate what can be gleaned from the reports:

EVERSON, P., Private, 1st Minnesota Volunteers. Gunshot wound through base of tongue, with fracture of jaw, July 2d, 1863. Hæmorrhage occurred July 14th, and both lingual arteries were tied in the wound *en masse* the same day. The patient recovered. In September, 1865, his general health was seriously impaired; he was unable to eat other than liquid food. Disability total.

ATWOOD, G., Private, 142d New York Volunteers. Gunshot injury of inferior maxilla and fracture of left fibula. October 27th, 1864. Hæmorrhage occurred from a branch of the superior thyroid, November 7th, 1864. Thyroid ligated November 7th, 1864. Recovered April 19th, 1865. In June, 1866, his disability was rated one-half and permanent.

CASE.—Private Benjamin Foote, Co. I, 4th United States Colored Troops, aged 22 years, received, at Petersburg, June 15th, 1864, a gunshot wound through the upper maxillary. He was conveyed to Portsmouth, and, on June 20th, admitted to the Balfour Hospital. There was, apparently, little laceration or comminution, but the patient was much debilitated from profuse hæmorrhage. On June 23d, Acting Assistant Surgeon C. C. Ella ligated the right facial artery just below the commencement of the ascending palatine, but the case terminated fatally on the same day at ten in the evening.

CASE.—Private William Gaines, Co. C, 5th United States Colored Troops, aged 20 years, received, at Petersburg, June 18th, 1864, a gunshot wound of the face. The ball entered the left cheek, fractured the inferior maxilla, right side, and emerged from the right cheek, cutting the right facial artery. He was conveyed to the Balfour Hospital, Portsmouth, on June 20th. Considerable laceration and comminution existed, especially on the right side. Secondary hæmorrhage occurred on June 25th, and, on the following day, Acting Assistant Surgeon C. C. Ella, ligated the right facial artery, near the inferior margin of the inferior maxillary. The patient improved steadily, and was transferred on July 19th, 1864.

BESSEL, A. J., Sergeant, 14th Michigan Volunteers. Gunshot fracture of inferior maxilla, right side, July 5th, 1864. Hæmorrhage occurred and facial artery ligated. Discharged January 4th, 1865.

MCCRAY, J., Private, 145th Pennsylvania Volunteers. Gunshot wound of lower jaw, May 12th, 1864. Hæmorrhage occurred June 4th, 1864. Facial artery ligated in wound, June 4th, 1864. Recovered July 1st, 1864.

WOODWARD, C. L., Private, 2d Vermont Volunteers. Gunshot fracture of right lower jaw, May 3d, 1863. Ligation of left facial artery in wound. Recovered February 19th, 1864.

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*Consult, on ligations, Dr. Gurdon Buek (*N. Y. Med. Times*, Nov. 1855). See the important papers of Dr. GEORGE NORRIS (*Am. Jour. Med. Sci.*, 1847, Vol. XIV, p. 13) and the first in the *Medico-Chirurgical Transactions* (by Mr. ASTLEY COOPER, and read Jan. 29th, 1806); M. P. BROCA, *Des anévrysmes*, Paris, 1856, p. 505; Dr. JAMES R. WOOD (*N. Y. Jour. of Med.*, July, 1857); N. CHEVERS, *Lond. Med. Gaz.*, N. S., Vol. I, p. 1140; HORNER, W. L., *Amer. Jour. Med. Sci.*, 1832, Vol. X, p. 403; BROWN, J. B., Surgeon U. S. A. *Am. Jour. Med. Sci.*, N. S., Vol. XXVIII, p. 415; ISAACS, C. E., *N. Y. Jour. of Med.*, Vol. XV., N. S., p. 151; see also BLACKMAN, *Western Lancet*, Vol. XVI; TWITCHELL, *New Eng. Jour. Med. and Surg.*, October, 1842; MUSSEY and COGSWELL, *same Journal*, Vols. XI, p. 359, and Vol. XIII, p. 357, 1824; WARREN, J. C., *Boston Med. and Surg. Jour.*, Vol. I, p. 42, 1828, and LEWIS, *same Journal*, Vol. II, p. 371, 1829.

Leaving the ligations, which will be reverted to in connection with operations for injuries of the neck, it may be noted that but few of the cases reported as excisions appear to have been extensive operations; but rather the removal of portions of bone that were partially detached or had perished from necrosis and required slight operative interference for their extraction. Yet there were important exceptions to this general statement, as in the cases of Downey (p. 348) and Spear (p. 365), where formal excisions were practiced of portions of the upper maxillaries, and those of Beamenderfer (p. 347), Murray (p. 351), Smith (p. 362), and Algoe (p. 365), in which considerable parts of the lower maxilla were excised. Most of these were intermediary operations; but several were performed at the field hospitals. In two or three instances staphyloraphy was early performed, and quite successfully in a case noted on p. 378. Commonly, wounds of the palatine region were too extensive to admit of an operation of such nicety.

FIG. 182.—Conoidal ball, split on impact with lower maxilla. *Spec.* 4537, Sect. I, A. M. M.

Of trephining the antrum to extract balls, a very few cases were reported, and one only (Keil, p. 366) in any detail.

An example of a ball splitting on the symphysis of the lower maxilla, after wounding the right common carotid, is illustrated by FIG. 182. An instance of the extraction from the orbit of two pieces of wire is described and figured in the following case:

CASE.—Private Simon Flory, Co. F, 1st Pennsylvania Artillery, aged 22 years, was admitted to Turner's Lane Hospital, Philadelphia, on July 11th, for a wound of the eye, received at Gettysburg, July 2d, 1863. A piece of iron wire, possibly from a case-shot, had entered the upper and inner part of the right orbit, and lodged. It was at once removed by the regimental surgeon, being broken in two pieces. By December 12th, the wound had healed, but the sight of the eye was destroyed. The above particulars, with the specimen, which is represented in the adjoining cut (FIG. 183) were contributed by Assistant Surgeon C. H. Alden, U. S. A. The man is a pensioner, and his disability was rated one-half in December, 1865, the eye being amaurotic. Examing Surgeon J. J. Crawford, of Williamsport, Lycoming County, Pennsylvania, under date of September 11th, 1866, states: "The projectile, a piece of canister wire the shape of a half circle, entered one point above the right eyeball, the other at the inner canthus of the same eye. The supra-orbital nerve was wounded by the upper point, and the violent concussion of the brain injured the optic nerve. The eye is amaurotic." The foreign body was removed by Surgeon M. F. Price, 1st Pennsylvania Artillery.

FIG. 183.—Iron wire removed from orbit. *Spec.* 4516, Sect. I, A. M. M.

In the shocking cases in which the greater portion of the lower maxilla was carried away by large projectiles, or where considerable parts of both jaws were destroyed, the mortality was far less than might have been anticipated. In many of these instances, ingenious prothetic apparatus was adapted, and the mutilated men were enabled to retain liquid food, and to avoid the dribbling of saliva, as well as to mask their deformities. No examples were reported of balls remaining lodged for a long time in the tongue, such as Larrey records.

The most important complication of wounds of the face, viz: hæmorrhage, will be reverted to in connection with wounds of the neck.*

* Consult HOLMES, *op. cit.* Vol. II, p. 183; DÖBBELIN, *De Uniendis Virlnerum Oris*, Halae; WISEMAN, *Several Chirurgical Treatises*, London, 1676, p. 361; RIBES, *Dict. des Sci. Méd.*, Paris, 1818, T. 29, p. 375; GARRETSON, *A Treatise on the Diseases and Surgery of the Mouth, Jaws, and Associated Parts*, Phila., 1869; JOUDAIN, *A Treatise on the Diseases and Surgical Operations of the Mouth and Parts Adjacent*, Phila., 1851; MALGAIGNE, *Traité des Fractures et des Luxations*, Paris, 1874, T. I, p. 378; *Journ. Gén. de Médecine*, T. LXIII. p. 4, and T. LXVI, p. 80; *Révue Médicale*, 1824, T. IV, p. 465; *Dict. de Médecine*, Paris, 1832–1845, T. XIX; HOUZELOT, *Thèse Inaug.*, Paris, 1827; NEUCORT, *Obs. de Fract. de la Machoire Inf.*; *Journ. de Chir.*, 1844, p. 359; DESAULT, *Journ. de Chir.*, T. I, p. 8; LECAT, *Remarques sur une Espèce Part. de Fract. de la Machoire Inf., Supplément aux Inst. Chir. d'* HEISTER, p. 154; ROSSI, *Mél. Opérat.*, T. I. p. 78; VIDAL, *Traité de Path. Ext.*, Paris, 1861, T. III, p. 502; FLAJANI, *Collezione osservazioni, etc.*, Roma, 1802, T. III, p. 166; *Annales de la Chirurgie*, T. VIII, p. 472; MICHAËLIS, *Beschreibung, etc., Journal der Chirurgie*, VON GRAËFE und WALTHER, 1823; BÉRARD, *Gaz. des Hôpitaux*, 19 Août, 1841; BUSH, *London Med. and Phys. Journal*, Nov. 1822, p. 401; WILES, *A Practical Treatise on Surgical Apparatus, Appliances, and Elementary Operations*, Phila., 1867; PERCY, l. c. p. 116; BOYER, l. c.; DELALAIN, *Bulletin de l'Acad. de Méd.*, Paris, April 15th, 1872.

CHAPTER III.

WOUNDS AND INJURIES OF THE NECK.

The wounds and injuries of the neck reported, and here to be considered, numbered about five thousand. The results are tabulated at the conclusion of the chapter. So many injuries of the neck were complicated, either by lesions of the face, or of the chest, or of the cervical vertebræ, or of the great vessels of the neck, that the conclusions must be regarded as approximative only, a large number of cases being elsewhere classified. Many ligations of the carotids are included. The injuries of the spine are separately considered in the fourth chapter. This chapter will include sections on miscellaneous injuries, on gunshot wounds, and on operations.

Section I.

INCISED AND PUNCTURED WOUNDS, AND MISCELLANEOUS INJURIES.

Forty-six cases of this nature appear on the returns, comprising a few sabre and bayonet wounds, suicidal attempts with razors, stabs from knives, and contusions from various causes. The cases of sabre and bayonet wounds will be specified, and the remaining cases tabulated. There was one instance of an unimportant injury from a fragment of a torpedo.

Sabre Wounds.—There were five cases that came under treatment, as follows:

Little, J. H., Private, Co. B, 18th Pennsylvania Cavalry, aged 24 years. Flesh wound of left side of neck; sabre. Satterlee Hospital, Philadelphia. Duty, January 23d, 1864.

Payton, William, Private, Co. K, 8th Virginia Cavalry, aged 22 years. Sabre wound of left side of neck. Bunker Hill, Virginia, September 3d, 1864. Division No. 1 Hospital, Annapolis, October 9th. Deserted, November 29th, 1864.

McIntosh, David, Sergeant, Co. E, 6th Ohio Cavalry. Sabre wound of back of neck. Cavalry raid in Virginia, May 9th to 15th, 1864.

Mooney, Daniel T., Private, Co. H, 2d New Jersey Cavalry. Sabre wound of right side of neck. Newark Hospital, Newark, New Jersey, February 22d, 1864. Discharged April 8th, 1865, for unreducible dislocation of right shoulder.

Jacobs, Thomas, Private, Co. I, 1st Potomac Home Brigade. Sabre wound of neck; slight. Monocacy Junction, Maryland, July 9th, 1864. Hospital at Frederick, July 13th, 1864. Transferred to Baltimore, and returned to duty on August 2d, 1864.

Bayonet Wounds.—Three slight cases and one that was fatal were reported. In the latter, the great vessels of the neck were perforated:

Hassett, B. J., Bugler, Co. F, 121st New York Volunteers, aged 19 years. Bayonet wound of right side of neck; slight. Wilderness, May 5th, 1864. Washington, Baltimore, and Annapolis hospitals. Returned to duty on August 16th, 1864.

Moore, James, Corporal, Co. D, 38th Ohio Volunteers, aged 24 years. Bayonet wound of neck, Jonesboro', Georgia, September 1st, 1864. Nashville, Cincinnati. Mustered out on June 21st, 1865.

Dustin, Elbridge, Private, Co. B, 9th New Hampshire. Bayonet wound of neck. Jackson, Mississippi, July, 13th, 1863. Surprised on picket and brought into hospital dead.*

Little, John N., Sergeant, Co. I, 2d West Virginia Volunteers. Bayonet wound of neck, posterior to pharynx, April 18th, 1865. Discharged on June 21st, 1865.

Table XVI.

Results of Forty-six Cases of Injuries of the Neck from Miscellaneous Causes.

CHARACTER OF INJURY.	Cases.	Duty.	Discharged.	Died.	Unknown.
Sabre Wounds	5	2	2	.....	1
Bayonet Wounds	4	1	2	1	.....
Contusions	9	6	.....	.....	3
Punctured Wounds (not bayonet),	2	1	.....	.....	1
Incised Wounds (not sabre),	27	16	4	5	2
Aggregates	47	26	8	6	7

The more important incised wounds of the neck were self-inflicted, in awkward attempts at suicide; the knife being applied too high up missed the great vessels. A remarkable illustration may be cited:

Case.—Private J. L. McC———, Co. C, 23d Massachusetts Volunteers, entered Academy Hospital, New Berne, April 9th, 1862. He had cut his throat at the level of the crico-thyroid cartilage, the incision severing the larynx and œsophagus, and extending to the inner borders of the sterno-mastoid. He fiercely resisted any attempt to dress his wound or to introduce a stomach tube. The bleeding was comparatively unimportant. The most remarkable feature of the case was the sufferer's intense thirst. From a pail of water, placed above the level of his head, he could suck through a rubber tube, by bending forward and closing the wound, a little water that was apparently swallowed;—then, using the tube as a syphon, he would let the water pass through the pharynx and escape through the wound. He required eight pailfuls, or twenty gallons of water daily. Unavailing attempts were made to anæsthetize him in order to administer nourishment. He died exhausted on April 15th, 1865.

Case.—H. W———, jailor, was hanged at Washington, November 10th, 1865. He was about 40 years of age, and weighed about 160 pounds. The rope was half an inch in diameter; the knot was placed under the left ear; the fall was five feet. The body was suspended for fifteen minutes and then removed to the hospital. No rigor, no relaxation of sphincters, no seminal ejaculation. Face pallid; eyes not congested, pupils dilated; mouth open, but tongue not protruding. Cicatrices on left shoulder, forearm, and legs, of old ulcers, probably scorbutic. A deep sulcus, with tumefaction of the adjacent soft parts. Laceration of the inner fibres of the trapezius and of the belly of the sterno-mastoid was observed on removing the skin. The hyoid bone had received six injuries—separation of the greater and lesser processes on both sides from the body of the bone and true fracture of the outer third of the greater process on either side. There was no lesion of the brain. The atlas and axis had not been luxated, and the spinal cord had escaped compression. In the thorax, old pleuritic adhesions; aortic insufficiency, with calcareous deposits; in the abdomen, nothing abnormal. On the right forearm were cicatrices and two small indolent ulcers, involving the integuments only. The bones of the forearm had not been fractured or resected. Drs W. Thomson and H. Allen, from whose official report the foregoing notes are taken, remark the extreme rarity of fractures of the hyoid. Death resulted from apnœa alone. The specimens forwarded with the report are Nos. 298 to 302, inclusive, in the Surgical Section. The preparation of the hyoid is represented in the wood-cut (Fig. 184).

Fig. 184.—Fracture of hyoid bone, from suspension. *Spec.* 299, Sect. I, A. M. M.

* See Reports of Surgeon W. A. Webster, 9th New Hampshire Vols., and of Natt Head, Adjutant General of N. H.

Section II.

GUNSHOT WOUNDS.

Gunshot wounds of the neck may be subdivided into those of the anterior, lateral, or posterior cervical region. The injuries of the anterior region may be grouped in two lesser divisions—as they are inflicted above or below the hyoid bone. Among them, wounds of the larynx, hyoid bone, trachea, pharynx, and œsophagus are presented for consideration. In the lateral region, lesions of the great vessels, of the pneumogastric and sympathetic nerves, and of the chain of lymphatic glands are encountered. The posterior sub-region, occupied by strong muscles, with comparatively unimportant nerves, vessels, and lymphatics, is of less interest, in a surgical point of view, than the others. A few abstracts of the gunshot flesh wounds may be noted:

Case.—Lieutenant John O'Connor, Co. A, 7th Missouri Volunteers, received a gunshot wound of the neck, at Vicksburg, Mississippi, May 22d, 1863. The missile entered the posterior superior process of the scapula, passed upward and emerged one inch below the angle of the right jaw. He was treated in the field hospital until June 22d, when he entered the City Hospital, St. Louis, Missouri. On July 24th, he was transferred to Jefferson Barracks, and finally mustered out at the expiration of his term of service on June 14th, 1864. He is not a pensioner.

Case.—Private Allen Gregg, Co. A, 73d Indiana Volunteers, was wounded at Day's Gap, Alabama, April 30th, 1863, a buckshot entering at the back of the right ear and emerging from the posterior aspect of the neck. On May 27th, he was admitted to the 1st division hospital, Annapolis, Maryland. The wounds healed, and he was returned to duty on March 1st, 1864 He is not a pensioner.

Case.—Private John Knuller, Co. E, 1st Michigan Cavalry, aged 38 years, received a gunshot wound of the neck at Cold Harbor, Virginia, June 3d, 1864, a conoidal ball entering the left side, just below the occipital protuberance, and emerging above the seventh cervical vertebra. He was taken to the hospital of the 1st division, Cavalry Corps, where simple dressings were applied to the wound. On June 7th, he was sent to Harewood Hospital; on June 18th, to Summit House Hospital, Philadelphia, and, on August 18th, to the Satterlee Hospital. By October 25th, the wound of exit had entirely healed, but reopened on December 25th, discharging freely. On July 18th, 1865, he was transferred to Harper Hospital, Detroit, Michigan, and discharged from service on October 2d, 1865. He is not a pensioner.

Case.—Private Franklin Smith, Co. B, 28th United States Colored Troops, of an athletic constitution, was wounded in the left side of the neck at Camp Fremont, Indiana, April 24th, 1864, a pistol ball striking near the angle of the maxilla, posterior to the carotid artery. He was taken to the regimental hospital, where simple dressings were applied to the wound. It was said that immediately after the reception of the injury, the ball was distinctly felt one inch and a half below the point of abrasion, the surface of which might be said to be hermetically closed. He was not confined to the hospital, apparently suffering but little from his wound. He is not a pensioner.

Case.—Private *J. J Gibson*, 17th South Carolina Regiment, aged 21 years, received a gunshot wound of the throat, near Petersburg, Virginia, August 6th, 1864, the missile entering below the external meatus of the left side, and emerging in the inferior triangle on the right side of the neck. He was taken to the Confederate Hospital, Petersburg, and furloughed on August 27th, 1864.

The next case was regarded by Surgeon J. H. Brinton, U. S. V., as an excellent illustration of the incised appearance occasionally presented by the entrance wounds of conoidal balls, and a water-colored drawing (No. 11, Surgical Series) was made, by Dr. Brinton's direction, by Hospital Steward E. Stauch. This is carefully copied in the left-hand figure of the chromo-lithograph facing page 367.

CASE.—Private Anthony Speigle, Co. K, 5th United States Cavalry, was wounded at Beverly Ford, Virginia, June 9th, 1863, by a ball, which entered the back of the neck and passed out on the right side some two inches above the clavicle. He was sent to Washington; admitted to Lincoln Hospital on the 10th; transferred to Philadelphia on the 22d, and admitted to the McClellan Hospital on the 23d. By this time, a cicatrix had formed. He was returned to duty cured on August 23d, 1863. Speigle is not a pensioner.

CASE.—Private J. H. McKittrick, Co. F, 66th Ohio Volunteers, aged 20 years, received a gunshot wound of the neck at Cedar Mountain, Virginia, August 9th, 1862. The missile entered just behind and at the base of the lobe of the left ear, passed forward beneath the integument, and emerged at about the middle of the chest. He was admitted, on the 13th, to the 3d division hospital, Alexandria, Virginia, where cold water dressings were applied to the wound. He was transferred on August 30th, 1862, at which time he was doing well. He is not a pensioner.

CASE.—Corporal Uriah F. Snediker, Co. H, 2d Connecticut Heavy Artillery, aged 23 years, received a gunshot wound of the neck, by a conoidal ball, at Cold Harbor, Virginia, June 1st, 1864. He was taken to the hospital of the 1st division, Sixth Corps, and cold water dressings were applied to the wound. On June 6th, he was sent to the Soldier's Rest Hospital, Alexandria; on June 16th, to Mower Hospital, Philadelphia, and, on July 13th, to Knight Hospital, New Haven, Connecticut, whence he was discharged the service on June 7th, 1865. He is not a pensioner.

CASE.—Private *Joseph S. Hambright*, Co. F, 17th South Carolina, aged 19 years, was wounded at Burkesville, Virginia, April 9th, 1865, by a conoidal ball, which entered in front of the lobe of the left ear and emerged one and a half inches below the occipital protuberance. He was taken prisoner, and, on the 11th, admitted to the hospital of the Tenth Corps, near Humphrey's Station. On April 19th, he was sent to Lincoln Hospital, Washington, whence he was released on June 9th, 1865.

CASE.—Private *A. J. Bowen*, Co. E, 48th Georgia, aged 27 years, was wounded at Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal ball, which entered about the centre of the inner border of the trapezius muscle, right side, passed beneath that muscle, and emerged from the back between the inferior angle of the scapula and the spine. Another ball entered the right side of the back over the tenth rib, passed horizontally across and emerged about one and a half inches from the spine. He also received a wound of the scalp on the back and left side of the head, about three inches in length and one and a half inches in width, which was apparently caused by a fragment of shell. He was taken prisoner and conveyed to the Seminary Hospital, Gettysburg. Cold water dressings were applied to the wound, and tonics and stimulants given, with a Dover's powder at night. By July 15th, the wounds in the neck and back were suppurating freely; the discharges were healthy. His appetite was gone, and he was very much disheartened and reduced. On the 18th, there was considerable inflammation around the wounds in the back, and, on the 19th, erysipelatous inflammation set in, extending from the umbilicus around the body up to the neck. The face was also inflamed, the eyes being completely closed, and the skin was in a frightful œdematous condition. The wounds looked healthy, with the exception of the neck. There was considerable hæmorrhage during the night. Pulse faint. A local application of tincture of iodine was made, and beef tea given. On the 20th, the inflammation on the body had subsided; the face and eyes were still œdematous. He continued to improve, and, on July 27th, was sent to the hospital at Camp Letterman, whence he was transferred to the Provost Marshal on September 16th, 1863, for exchange.

The two following cases are illustrated by a plate copied from the water-colored drawing, made by Dr. Brinton's direction, to illustrate the appearances of entrance and exit gunshot wounds. The first figure illustrates how a ball may almost harmlessly traverse a region containing organs of vital importance; and the second illustrates the resiliency of the great vessels of the neck. It was the opinion of several surgeons, who saw the case, that the ball had passed through the sheath of the carotid, and probably between the carotid and jugular vein:

CASE.—Private George W. Brown, Co. I, 4th Vermont Volunteers, was wounded at Fredericksburg, on May 3d, 1863, by a conoidal musket ball fired at a distance of thirty yards. The missile having entered the neck posteriorly on the right side, passed into the mouth, knocking out three of the lower teeth, and escaped. Being sent to Washington, the patient was admitted to the Judiciary Square Hospital on the 8th; the wound was dressed simply. On the 9th, he was transferred to De Camp Hospital, New York Harbor, and, on July 16th, to General Hospital at Brattleboro', Vermont. He was returned to duty on November 6th, 1863.

CASE.—Private Joseph Keepers, Co. G, 17th Pennsylvania Cavalry, was wounded in the neck at Beverly Ford, Virginia, June 9th, 1863. He was mounted at the time, and distant from the enemy about one hundred and fifty yards. The missile, a conoidal ball, entered the right side of the neck, just below the chin, at the anterior border of the sterno-mastoid muscle, and, passing backwards about three inches, emerged. There was excessive hæmorrhage, and the shock was great. The patient being sent to Washington was admitted to Lincoln Hospital on the 10th; ice was applied to the wound; low diet ordered. On June 11th, the wound was very painful; treatment continued. June 16th, steadily improving, very little discharge from wound, water dressing, half diet; June 19th, free discharge, full diet. On June 22d, he was transferred to Philadelphia, and admitted to the McClellan Hospital. His condition at that time was good, and the wound is reported to have healed without any changes or symptoms worthy of notice. On April 15th, 1864, the patient is reported to be unable to turn his head freely from side to side, in consequence of the sterno-cleido-mastoid muscle having lost its function. He was transferred to duty in the Veteran Reserve Corps, May 3d, 1864. Examining Surgeon J. L. Suesserott, of Chambersburg, Pennsylvania, reported March 9th, 1867, that * * * "his right arm is weak and somewhat atrophied." His disability is rated at the Pension Office as one-half and not permanent.

Fig 1

Fig 2

Ed Stauch pinx

J Bien Chromolith

WOUNDS OF THE NECK BY CONOIDAL MUSKET-BALLS.

There were others pensioned on account of wounds of the neck, regarding whom it it was difficult to decide, either from the hospital or pension reports, whether they were slightly or seriously injured:

CASE.—Private John Valentine, Co. K, 88th Pennsylvania Volunteers, aged 19 years, was wounded at Cold Harbor, May 30th, 1864, by a conoidal ball, which entered the right side of the neck, near the inner border of the trapezius muscle, passed obliquely downward, and to the left, and emerged near the axillary border of the lower angle of the scapula. He was, on June 4th, admitted to Mount Pleasant Hospital, Washington, and, on June 9th, transferred to Philadelphia, where he was admitted to the South Street Hospital on June 13th. Simple dressings were applied to the wound, also compress wet with lead water, and tincture of iodine was painted over the track of the ball. Milk punch was freely administered. The wound discharged pus freely, and the patient was very weak. On July 21st, the wounds were healed. He was returned to duty on September 8th, 1864. On May 14th, 1866, Pension Examiner J. Cummiskey reports that the patient has a great deal of pain in the back of the neck, and feebleness of the left arm, which has existed since the reception of the wound.

CASE.—Private B. F. Hawkins, Co. D. 7th Ohio Volunteers, received a gunshot wound of the neck at Port Republic, Virginia, June 9th, 1862. The missile entered above the middle of the spine of the scapula on the right side, and emerged at the middle of the sterno-cleido mastoid muscle, anterior border. He was admitted to Cliffburne Hospital, Washington, June 15th, 1862, and returned to duty on August 5th. On August 12th, he was admitted to the 3d division hospital, Alexandria, and again returned to duty on March 2d, 1863. Pension Examiner A. O'Brien reports, September 6th, 1866, that the muscles which elevate the arm were cut across.

Many fatal cases were reported so indefinitely, that it was possible only to conjecture the probable cause of death, the extent and nature of the wounds, and character of the succeeding symptoms being referred to with extreme brevity, if at all. The following may serve as illustrations of this class:

CASE.—Private Thomas McIlvaine, Co. E, 110th Pennsylvania Volunteers, was wounded at Winchester, March 23d, 1862, by a musket ball, which entered one inch below and behind the mastoid process, and emerged over the spinous process of the third cervical vertebra. On April 2d, he was admitted into Saint Joseph's Hospital, New York, with slight fever. Simple dressings were applied to the wound. Sulphate of quinine, refrigerant drinks, tonics, and milk punch were administered, and nourishing diet ordered. Profuse epistaxis occurred on April 7th, and recurred on the 8th, when gastritis, followed by hæmatemesis set in. On April 12th, the patient was unable to articulate; difficult deglutition and involuntary evacuations ensued; he sank gradually, and died on April 13th, 1862.

CASE.—Corporal Warren Rutan, Co. I, 1st New Jersey Cavalry, aged 20 years, received a gunshot wound of the neck by a conoidal ball, at Salem Creek, Virginia, May 28th, 1864. He was taken to the hospital of the 2d division, Cavalry Corps; on June 4th, sent to Mount Pleasant Hospital, Washington; on June 10th, to DeCamp Hospital, New York; on June 14th, to Grant Hospital, New York; and finally, on October 20th, 1864, to Ward Hospital, Newark, N. J. He died while at home on furlough, March 21st, 1865.

CASE.—Private George W. Buffum, Co. D, 5th Wisconsin Volunteers, aged 39 years, received, at Harper's Farm, Virginia, April 6th, 1865, a gunshot wound of the shoulder and neck, by a conoidal ball. He was taken to the hospital of the 3d division, Ninth Corps, and on April 15th, sent to the hospital at Annapolis, Maryland. When admitted he was much exhausted, and partially delirious. He suffered extreme pain in the injured parts. His appetite was poor, and he was able to retain but a small quantity of solid food. Dry oakum was applied to the wound, and tonics and stimulants administered. Death resulted on April 28th, 1865.

Balls lodged, extracted, or discharged.—In one hundred and thirty-six cases of gunshot wounds of the neck, the missile lodged. From these numerous examples of lodgement of small projectiles in the neck, the following abstracts are selected. In most cases of this class (in eighty-seven, to speak more precisely), the missiles were extracted; in others, they were probably encysted, causing no immediate inconvenience; less frequently, they gravitated through the soft parts, toward the nearest cavity or exterior surface, and were eliminated spontaneously:

CASE.—Private John R. Fletcher, Co. A, 10th Illinois Cavalry, received a gunshot wound of the neck at Bayou Teche, Arkansas, September 10th, 1863, the ball lodging in the complexus muscles of the left side. He was admitted, on the next day, to the hospital at Little Rock, where the ball was removed, and he was returned to duty on October 23d, 1863. He is not a pensioner.

CASE.—Private Ludovico Bowles, Co. D, 24th Michigan Volunteers, was wounded at Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball, which entered the left side of the neck just below the submaxillary gland, traversed the base of the tongue, and lodged upon the right side just below the base of the jaw. He was taken to the regimental hospital; the ball could

be felt in seat of lodgement. The patient was so refractory that it could not be cut to in the mouth, where the incision would have been slight. Partial anæsthesia was induced with difficulty. The ball was pressed by the finger, below the right submaxillary gland, the forceps had been passed to the ball by way of entrance, but extraction was impracticable. On June 14th, he was sent to Mount Pleasant Hospital, Washington, and, on June 16th, to West's Buildings Hospital, Baltimore, whence he was returned to duty on July 3d, 1863. He is not a pensioner.

Case.—Private Isaac D. Davis, Co. I, 156th New York, was wounded at Fort Beslin, Louisiana, April 9th, 1863, by a fragment of shell, which struck the posterior surface of the neck. The missile was cut out. In August, 1867, Davis reënlisted in the Veteran Reserve Corps. There was not any bad result; the movements were normal. He was also injured by a fall at Alexandria, Louisiana, causing a fracture of the left elbow-joint. The movement of the joint was very fair. It was suspected there was a rupture of the circular ligament, for which he was treated by flexion at right angle. His health was good. He was discharged from service on April 7th, 1869. His claim for pension is pending.

Case.—Corporal Albion L. Jackson, Co. I, 13th Massachusetts Volunteers, was wounded at Gettysburg, Pennsylvania, July 1st, 1863, by a conoidal ball, which entered near the malar process of the left superior maxillary bone and lodged beneath the angle of the left. He was admitted on the same day to the regimental hospital. For three weeks afterward a hard substance could be felt beneath the angle of the jaw, when it disappeared, and the left side of the pharynx, corresponding, began to be swollen. He returned to his regiment suffering no inconvenience from his wound, which had healed, nor from the swollen pharynx, except a slight pain on deglutition, which would be increased on taking cold, when also bloody matter would be expectorated. On the morning of October 26th, 1863, he was awakened by something in his throat, which, with a little effort, was spit out and proved to be a conoidal lead bullet, so flattened at its base as to form, on one side of it, nearly parallel lips, which held between them some apparently fibrous and earthy substance. At the time the bullet was discharged, there was but slight expectoration, and the swelling and soreness of the pharynx soon disappeared. He is not a pensioner.

Case.—Private William Herbert, Co. H, 159th New York Volunteers, aged 22 years, was wounded at Cedar Creek, October 19th, 1864, by a conoidal ball, which entered at the left side of the sixth cervical vertebra, and lodged just above the middle of the left clavicle. He was conveyed to the hospital of the 2d division, Nineteenth Corps, and transferred to Baltimore, where he was admitted into the Jarvis Hospital on October 27th. Simple dressings were applied to the wound. The missile was extracted on November 7th. On December 11th, he was admitted to Mower Hospital, Philadelphia, whence he was discharged the service on June 7th, 1865. On October 25th, Pension Examiner Charles Rowland, stated that Herbert had pain in the left breast, with severe cough, and general debility, resulting from the wound.

In the following case, an inch and a quarter grape-shot, from a battery about three hundred yards distant, was deflected on striking the hyoid bone, and buried itself in the muscles over the right shoulder-blade, whence I cut it out. He died on the fourth day from œdema of the glottis:

Case.—Private Frederick Soulé, Co. F, 27th Massachusetts Volunteers, was wounded at New Berne, March 14th, 1862, by a large grape shot. The missile entered near the right horn of the hyoid bone, passed obliquely across the neck, and lodged in the subscapular fossa, from which it was removed by an incision. Very little irritative fever supervened. Water dressings were applied to the wound, and morphine administered. On the night of March 18th, 1862, the patient was unexpectedly seized with a choking fit, and died suddenly half an hour thereafter.*

Case.—Private George R. Boorman, Co. H, 18th United States Infantry, was wounded at Chickamauga, Georgia, September 20th, 1863, by a conoidal ball, which entered the left side of the neck, a little above the level of the thyroid cartilage, passed through the sterno-mastoid, and, ranging forward and downward, lodged. He was admitted on the next day to the hospital at Chattanooga, Tennessee. There was considerable swelling of the left side of the neck, and most oppressive dyspnœa. On September 24th, a solid foreign substance, which was decided to be the ball, was detected lying at the sternal extremity of the left clavicle, at which point there existed the greatest degree of swelling. The wound of entrance was carefully enlarged, and the ball removed by forceps after it had been raised by external manipulation. During the operation a considerable amount of pus was evacuated. His breathing was but little improved, even for a short time, and death resulted on the morning of September 25th, 1863, from apnœa. At the autopsy, eight hours after death, the fact was revealed that the sheath of the common carotid artery, together with the trachea, served for a part of the wall of the abscess; no part of the air passages had been penetrated by the ball or pus. The bronchial glands were very much enlarged, and all the tissues covering the anterior part of the neck were so much congested and swollen as to preclude the possibility of performing tracheotomy. The left side of the thyroid cartilage bore evidence of having been struck by the ball. Beneath the cartilage proper and its mucous lining was a thin layer of coagulated blood. Within the larynx were all the evidences of general laryngitis; muco-purulent matter, with congestion, producing nearly entire occlusion of the air passages. The conoidal extremity of the ball was bruised on one side and grooved as if from striking some solid body.

Case.—Corporal *James A. Hayes*, Co. A, 6th Alabama Regiment, aged 18 years, was wounded at South Mountain, September 14th 1862, by a conoidal ball, which entered above the clavicle, and lodged between the scapula and the spinal column, right side. He was, on September 24th, admitted to National Hospital, Baltimore. Simple dressings were applied to the wound; tonics and stimulants were administered. An abscess had formed around the ball, and a quantity of pus flowed through the incision made to remove the ball. The patient had one attack of erysipelas On November 29th, he was sent to the South to be exchanged, cured.

* See *Report of the Wounded at the Battle of New Berne*, American Medical Times, July 5, 1862.

CASE.—Private Jeruel Leonard, Co. I, 38th, Indiana Volunteers, aged 21 years, received, at Perryville, October 8th, 1862, a gunshot wound of the back of the neck; also a gunshot fracture of the os calcis; the ball lodged. He was, on October 26th, admitted to Hospital No. 1, Louisville. On admission, the wound of the heel presented an indolent, flabby appearance. Linseed poultices were applied to the wound, belladonna plaster to the back, and tonics, stimulants, and opiates were administered. On November 2d, tetanus appeared, trismus, with quick contraction of the extensor muscles, occurring in spasms; the bowels were costive, and the patient sweating. On November 4th, he had convulsions every fifteen or twenty minutes; profuse sweating and costiveness. On November 5th, the convulsions were less frequent and severe; still costive, and sweating profusely. On November 8th, the patient had convulsions every thirty minutes, and from that time the convulsions grew less frequent. On the 25th, he was able to sit up in a chair; the use of the muscles of the jaw were natural, and the wounds had healed. He was discharged the service on January 12th, 1863. The case is reported by Acting Assistant Surgeon A. W. Kayes. Leonard is not a pensioner.

Foreign Bodies Extracted.—It was not uncommon for bits of clothing, buttons, wire, and other fragments of the soldier's outfit to be buried in the wound:

CASE.—Private Garret Lukens, Co. E, 88th Pennsylvania Volunteers, aged 40 years, was wounded at Gettysburg, July 1st, 1863, by a conoidal ball, which entered just below the middle of the sterno-cleido-mastoid muscle, and emerged over the sixth cervical vertebra. He was, on July 7th, admitted to Satterlee Hospital, Philadelphia. Flaxseed poultices were applied to the wound; tonics, stimulants, and cod-liver oil were administered, and full diet ordered. On August 25th, a piece of blouse was taken from the posterior part of the wound. The patient had severe night sweats, and a tendency to anæmia. On October 20th, he had slight tonsilitis, and stiffness of the neck. He was returned to duty March 24th, 1864. The case is reported by Acting Assistant Surgeon W. J. Grier. Lukens is not a pensioner.

CASE.—Sergeant J. R. Gemmel, 8th New York Battery, was wounded at Fair Oaks, May 31st, 1862, by a musket ball, which entered over the left border of the trapezius muscle, opposite to the sixth cervical vertebra, passed upward and inward, and lodged in the superior carotid triangle, immediately external to the trachea. On the reception of the injury the patient fell from his horse, receiving a contusion of the left arm. He was, on June 4th, admitted to Douglas Hospital, Washington. Simple dressings were applied to the wound. On June 6th, the patient had considerable difficulty of deglutition. An abscess had formed, which was opened, and the ball, with a piece of cloth one inch in length, was extracted, and difficulty of deglutition disappeared. June 20th, there was neuralgic pain in the arm, and impairment of its use. He was discharged the service July 11th, 1862. The case is reported by Assistant Surgeon William Thomson, U. S. A. Gemmel is a pensioner. The Examining Surgeon reports that the ball must have severed some part of the cervical plexus of nerves, as there is complete paralysis of arm and hand. The arm is much smaller than it should be, and cannot be used except for very light work.

Torticollis.—Many examples of wry-neck will be found among the abstracts of cases, in which some other complication was a more prominent feature. It is the opinion of Dr. Stromeyer* that when the muscles only are injured, in gunshot wounds of the neck, torticollis will not be permanent, and there is no higher authority on this particular subject. Yet the reports of the pension examining surgeons indicate that distortion of the neck from wounds of the sterno-mastoid is often very persistent.

CASE.—Private Andrew Burknett, Co. E, 25th Kentucky Volunteers, aged 31 years, received a gunshot wound of the neck and side at New Hope Church, Virginia, May 27th, 1864. He was taken prisoner, and afterward paroled and admitted to the hospital at Camp Chase, Ohio. On February 23d, 1865, he was transferred to the Tripler Hospital at Columbus, Ohio. On admission, the patient was in a debilitated condition consequent upon his long imprisonment, and suffering from a severe hernia. Partial torticollis supervened. He was discharged from service on April 10th, 1865. He is not a pensioner.

CASE.—Private Baltzer Weild, Co. K, 9th Pennsylvania Volunteers, received, at the battle of Bull Run, August 30th, 1862, a gunshot wound of the neck, on the right and posterior portion. The missile passed under the trapezius muscle and emerged at the opposite side. He was, on the following day, admitted to the Mansion House Hospital, Baltimore, Maryland. He was returned to duty on November 18th, 1862. Examining Surgeon G. McCook reported that the patient's head was bent and could not be moved.

CASE.—Private Christopher Kallehan, Co. I, 95th Illinois, was admitted, from the field, to McPherson Hospital, Vicksburg, June 15th, 1863, having been wounded the same day by a conoidal ball, which entered the left cheek, passed downward and backward, struck the front of the atlas, and passing forward into the pharynx, was thrown out of the mouth. Simple dressings were applied to the wound. The patient was discharged the service on October 2d, 1863. There was permanent wry neck, and almost perfect deafness. His disability is rated at one-half. Pension Examiner H. A. Buck reports, February 6th, 1864, that the pensioner suffers from contraction of the left eyelid, deformity of the jaw and face, and deafness.

CASE.—Private Charles L. Clarke, Co. I, 27th Massachusetts Volunteers, aged 19 years, was wounded at Roanoke Island, February 8th, 1862, by a musket ball, which entered one inch below the lower jaw, and passed through the neck, just behind the windpipe, emerging at the same point on the opposite side, wounding the larynx and œsophagus in its transit. He was conveyed to the Craven Hospital, New Berne. The patient had severe hæmorrhage, which was controlled by pressure. He was transferred to Boston in April, 1862. He recovered, his head drawn to one side, and was discharged the service on August 18th, 1862. He is not a pensioner.

* *Maximen der Kriegsheilkunst*, S. 423.

Wounds of the Larynx and Trachea.—No instances were reported of fracture or laceration of the larynx or trachea from blows or falls, as are described by authors; but about two per cent. (2.2) of the *gunshot* wounds of the neck that came under treatment belonged to this category. In a few, the larynx and trachea were both involved; in others, the air passages, together with the pharynx or œsophagus, were implicated, as in the case described under the head of *torticollis* (Clarke, supra). Dr. Derby first cared for this man, arresting the profuse venous hæmorrhage by pressure and pledgets of lint. There could be no question that both trachea and œsophagus were wounded, for both liquids and air passed out of both wounds of entrance and exit. The patient remained under my care for several weeks subsequently. He could take fluid nourishment without the use of a stomach tube, and only on a few occasions, when he was sitting upright, was there any inconvenience from his soup or drink passing into the air-passages. The wound of the œsophagus was probably small. It has been impossible to ascertain the sequel of the case.

The returns corroborate the opinion of Mr. Blenkins (*op. cit.* p. 824) regarding the comparative frequency of gunshot wounds of the larynx, exposed as it is by its superficial position, size, and prominence. Aphonia, exfoliation of cartilage, and persistent fistulæ were among the consequences of these wounds. The trachea was less frequently injured by small projectiles than the larynx. Gunshot wounds of the organ are oftener observed in the posterior membraneous portion, undefended by cartilaginous rings, than elsewhere. Professor S. D. Gross remarks (*op. cit.* Vol. II, p. 384) that there is reason to believe that "this tube possesses the faculty of deflecting bullets." That missiles are diverted from their course on impact with the trachea, there is ample evidence. Abstracts of a few cases may be cited:

Case.—Corporal *J. W. Terry*, Co. B, 14th Virginia, was wounded at Spottsylvania, May 10th, 1864, by a conoidal ball, which entered the left side of the neck, passed through the trachea, and emerged parallel to the opposite point of entrance, and again entered the right shoulder anteriorly. On May 11th, he was admitted to the Receiving and Wayside Hospital, Richmond, the air from his lungs passing through the wounds of entrance and exit. On May 16th, the wound of entrance had closed; but, he breathed still through the wound of exit. On the 18th, the wounds were suppurating freely; the patient was able to swallow with comparative ease, the bowels were regular, appetite good, tongue clean; and there was no pain, except in breathing. On the 20th, he was evidently improving; sat up in bed and said he was feeling very well. About ten o'clock, some intermeddling woman going through the hospital, thinking that she would benefit the patient by renewing the dressing, and, without consulting the Surgeon in charge of the ward, removed the dressing and plugged the wound with cotton, saturated with turpentine. The patient, not being able to speak, was compelled to submit to this cruel treatment, which caused his death on May 20th, 1864, before the woman who did the mischief left his bedside. The case is reported by Surgeon W. F. Richardson, P. A. C. S.

Case.—Private Patrick Riley, Co. D, 1st New York Volunteers, aged 21 years, was wounded at Chancellorsville, May 1st, 1863, by a musket ball, which entered on the left side of the neck, passed behind the trachea, near the cricoid cartilage, and in front of the œsophagus, laying open both tubes. He was, on May 12th, admitted to Stanton Hospital, Washington. Enemata, stimulants, and opiates were administered, and beef tea injected by an œsophageal tube. Air and nourishment passed through the wound. The patient had a severe cough, and was restless and constipated. May 24th, vomiting occurred; 28th, emaciated from inanition; capillary circulation diminished; skin cool and moist; pulse slow and feeble, and the mind wandering. The patient died on May 29th, 1863. The case is reported by Assistant Surgeon P. C. Davis, U. S. A.

Case.—Private John Homer, Co. B, 18th Pennsylvania Volunteers, aged 18 years, was admitted to Douglas Hospital, Washington, June 4th, 1862, having been wounded by a missile which entered immediately below the zygomatic arch, passed downward through the parotid gland into the pharynx, and emerged through the integuments on a level with and one inch external to the thyroid cartilage on the opposite side. June 5th, patient being unable to swallow, and fluids taken into the mouth passing out at the lower orifice, he was nourished by fluids introduced into the stomach through a tube; pus and saliva discharged from wound. June 7th, no grave constitutional symptoms; patient still nourished by means of the stomach tube. June 8th, dyspnœa came on about four in the afternoon, and he died seven hours subsequently from apnœa.

Case.—Captain Ferdinand Mueller, Co. B, 9th Ohio Volunteers, was wounded at Chickamauga, Georgia, September 20th, 1863, by a conoidal ball, which entered the base of the neck on the right side, passed transversely and obliquely upward, and emerged beneath and midway between angle and chin of inferior maxilla, involving the trachea, thyroid and cricoid cartilages,

and external jugular vein. He also received a wound of the shoulder-joint. He was admitted, on the next day, to the hospital at Chattanooga, Tennessee. There was considerable swelling at first. He did well up to the 25th, when secondary hæmorrhage occurred. There was not much loss of blood. On the 26th it recurred, and the patient expired before surgical assistance arrived.

Aphonia.—In the following cases, however, chronic cough, or complete loss of voice followed gunshot injuries of the larynx or trachea. Dr. Chisholm* tells us of similar cases observed in the Southern armies, some requiring the use of a tracheal tube to prevent apnœa:

Case.—Sergeant Adolphus Mepsen, Co. F, 103d New York Volunteers, was wounded at Suffolk, May 3d, 1863, by a musket ball, which entered the neck two and a quarter inches to the left of the median line, and two inches above the clavicle, passed through the trachea, and emerged one and a quarter inches to the right of the median line. He was conveyed to the hospital of the 3d division, Ninth Corps. The patient spit up blood freely immediately after the injury, and lost the power of speech partially. Air made its escape by the wounds. Slight external hæmorrhage, and the spitting of blood continued only for a short time. He was transferred to the Chesapeake Hospital, where he was admitted on May 4th. Fourteen days after the reception of the injury the power to articulate began to return, and, on June 7th, the wounds had healed. He was transferred to the Veteran Reserve Corps. The case is reported by Surgeon T. H. Squires, 89th New York Volunteers. This soldier is not a pensioner.

Case.—Private Joseph Pearson, Co. F, 64th Illinois Volunteers, aged 18 years, received, at Atlanta, Georgia, July 22d, 1864, a gunshot wound of the neck. A conoidal bullet entered the integuments over and anterior to the larynx and injured the windpipe. He was admitted to the Marine Hospital, Chicago, September 3d, 1864. On the 16th, he was transferred to Camp Douglas, Illinois. His case is diagnosed as "aphonia from gunshot wound." Simple dressings. Pension Examiner John F. Daggett, reports, October 30, 1867, that the pensioner's voice is impaired.

Case.—Private James K. Deerner, Co. G, 102 Pennsylvania Volunteers, aged 34 years, was wounded at Cedar Creek, October 19th, 1864, by a conoidal ball, which entered the left side of the neck and passed through the trachea. He was taken to the field hospital, where simple dressings were applied. On October 22d, he was admitted to the Satterlee Hospital, Philadelphia. By November 1st, the wound had almost healed. Aphonia supervened. He was discharged from service on May 15th, 1865. He is not a pensioner.

Case.—Private August Beck, Co. D, 54th New York Volunteers, aged 42 years, was wounded at Gettysburg, July 2d, 1863, by a musket ball, which passed laterally through the thyroid cartilage, destroying the upper half and two-thirds of the anterior part, thereby injuring the chordæ vocales. He was, on July 9th, admitted to Satterlee Hospital, Philadelphia. Respiration was carried on largely through the apertures made by the ball, and when he attempted to speak, the air passed through with a hissing or sibilant sound. His voice was gone, but he could whisper with a strong expiratory effort; the sound, however, never became hoarse. The edges of the wound were approximated with silver sutures and adhesive plaster, with head flexed on the chest. Cold water dressings were applied. On September 1st, the wound had entirely healed, but the patient had lost his voice. He was transferred to the Veteran Reserve Corps on September 26th, 1863. The case is reported by Acting Assistant Surgeon W. W. Keen, jr. He is not a pensioner.

Case.—Colonel Morgan H. Chrysler, 2d New York Cavalry, aged 48 years, was wounded at Atchafalaya, Alabama, August 28th, 1864, by a minie ball, which entered at the interclavicular notch of the sternum, just at the point of the right clavicle, injured the trachea and the origin of the sterno-cleido-mastoid muscle, passed to the right and emerged at the superior point of the shoulder. He was sent home, where he was treated for about two months and a half, when he returned to duty. Mustered out of service on November 8th, 1865. A certificate from the Pension Examining Board states that "the right arm can scarcely be extended above the horizontal plane of the shoulder joint. The cicatrix of entrance extends across the clavicular origin of the sterno-mastoid muscle. Pressure upon it causes cough and spasmodic contraction of the laryngeal and pharyngeal muscles, which is visible upon the surface. Similar spasm is caused by loud speaking or by swallowing fragments of food of sufficient size to press upon the trachea in passing through the œsophagus. He has attacks, usually nocturnal, of extreme dyspnœa, with a sensation of complete constriction of the lower part of the trachea. These are very transient but often repeated—sometimes without assignable cause, but oftener after fatigue or exposure. This hyperæsthetic condition of the inferior laryngeal nerve seems to depend upon deep cicatricial contraction rather than upon a neuritis, as in the latter case, the length of time which has elapsed since the reception of the wound, nearly eight years, should have led to an implication of the nerve centres, of which there is no evidence. The disability is regarded as total and permanent, and depends both upon the impaired use of the right arm and upon the affection of the throat."

Case.—Corporal Lester Shaw, Co. G, 35th Ohio Volunteers, aged 34 years, was wounded at Chickamauga, Georgia, September 19th, 1863, by a conoidal ball, which entered the right shoulder, just behind the acromion, passed inward, injured the cavity of the shoulder-joint, fractured the clavicle badly in its external and middle thirds, produced a comminuted fracture of the first rib, passed obliquely upward under the skin, penetrating the neck between the trachea and the œsophagus, and emerged just in front of the left carotid artery, on a level with the pomum Adami. The œsophagus was slightly wounded, and the trachea partly severed and badly contused. He was taken to the hospital of the 3d division, Fourteenth Corps, where water dressings were applied, and liquid diet given. Severe inflammation ensued, followed by ulceration over the middle of the first

* "Several instances have occurred in the Confederate campaigns, where the trachea has been perforated by a shot, or the larynx carried away. Such contraction of the air passage and difficulty of breathing follows upon this accident, as to force the patient to wear, permanently, a tracheal tube, to protect him from attacks threatening suffocation. In such cases the voice is reduced to a whisper." Chisholm, *op. cit.* p. 309.

rib and beneath the clavicle. On September 25th, the patient was sent to hospital No. 16, Nashville, and, on October 3d, to hospital No. 1. Pus was discharged for several months, during which time several spiculæ of bone came away. On May 12th, 1864, he was transferred to the Corps d'Afrique Hospital, New Albany, Indiana, and, on June 29th, to the hospital at Camp Dennison, Ohio, whence he was discharged on September 20th, 1864, for expiration of term of service. Pension Examiner E. Mendenhall reports that he examined Shaw while home on furlough in February, 1864. The external wounds were healed. The ulceration beneath the clavicle discharged large quantities of pus, with an occasional spicula of bone. The whole shoulder was very sore, tender, and immovable, and the arm and hand were swollen and numb. The neck was tender on both sides, and he could scarcely speak above a whisper. After a long and tedious process, the wounds all healed. Dr. Mendenhall re-examined this patient in April, 1866. He suffered from hoarseness and dyspnœa, which increased on exertion, and was, no doubt, produced by narrowing of the trachea at the place of injury. The arm and shoulder were partially paralyzed; but the general health appeared to be good.

Wounds of the Pharynx and Œsophagus.—The gunshot wounds of these regions, that came under treatment in the hospitals, were less numerous than those of the more exposed portion of the anterior region of the neck. Complicated by lesions of the great vessels or nerves, in many instances, such instances often proved fatal on the field. I cite a few cases in which the wound seems to have been mainly confined to these canals. A review of the reports confirms, fully, the opinion of the accurate, reliable, and learned Hennen,* that we can only derive satisfactory explanations of the symptoms in wounds of the neck, or rational views as to treatment, by considering the region as a "complete and sympathyzing whole," Yet, for convenience sake, where so large a number of abstracts of cases are to be compared, it is well to employ subdivisions:

Case.—Private *R. Wiseman*, Co. C, 6th North Carolina Regiment, aged 23 years, was wounded at Winchester, September 19th, 1864, by a conoidal ball, which passed through the œsophagus. He was conveyed to the depot field hospital, Winchester. Simple dressings were applied to the wound. The patient suffocated from internal hæmorrhage, and died on September 21st, 1864.

Case.—Private Lewis O. Ritch, Co. C, 106th Pennsylvania Volunteers, aged 20 years, was accidentally wounded at Fairfax Court-house, September 20th, 1862, by a round musket ball and two buckshot. The ball entered below the thyroid cartilage, passing through the trachea, and lodged in the pharynx, from which it was subsequently extracted. One buckshot fractured the right side of the lower jaw, and destroyed five teeth, and another entered the left side of the neck, a few inches above the clavicle, and lodged, and is still in the neck. He was, on October 6th, admitted to Armory Square Hospital, Washington. Cold water dressings, lotions of lead and opium, and warm fomentations were applied to the wounds, and tonics and stimulants administered. There was much inflammation about the throat, and food could be swallowed only with difficulty; air passed through the wound in respiration. On October 10th, the wound discharged slightly, but healthy; on the 15th, discharged freely; patient exhausted, laboring under anorexia. On October 23d, inflammation, erysipelatous in character, was increasing, and, on the 26th, extended over the entire head and face. November 2d, the patient was improving, and, on the 6th, the wounds were healing. He was discharged the service on December 15th, 1862. The case is reported by Surgeon D. W. Bliss, U. S. V. Pension Examiner H. E. Goodman reports, September 1st, 1869, that there is a large depression over the cervical bone, loss of voice, difficulty of breathing, with constant cough. The lungs and heart are normal; the digestion is bad, and constant care is necessary to prevent inflammation.

Case.—Private Jonathan Colgrove, Co. F, 57th Pennsylvania Volunteers, aged 19 years, was admitted to McKim's Mansion Hospital, Baltimore, on July 5th, 1863, for a gunshot wound of the neck, received at Gettysburg, July 2d, 1863. The missile having entered the right side near the submaxillary triangle, emerged on the opposite side, near the median line, perforating the cricoid cartilage and wounding the œsophagus. Cold-water dressings were applied to the wound, and a full diet allowed. For some days after the reception of the injury, both air and liquids escaped from the wound. On August 15th, there was partial aphonia. This man was returned to duty on August 24th, 1863. He is not a pensioner.

Paralysis.—Many examples of paralyses, partial or total, resulting from gunshot wounds of the cervical nerves, or of those ascending to the face or descending to unite in the brachial plexus, are found in the reports. A few abstracts may be cited:

Case.—Private John P. Crole, Co. F, 27th Michigan Volunteers, was wounded at Poplar Grove Church, Virginia, September 30th, 1864, by a minie ball, which entered two inches above the sternal extremity of the left clavicle, emerging at the superior angle of the left scapula. He was treated in the hospitals of the Ninth Corps until October 5th, when he was admitted to Mount Pleasant Hospital, Washington, and discharged on March 20th, 1865. There was partial loss of motion of left arm. He is not a pensioner.

* The close and intimate connection of the great vessels and nerves, and of the canals leading to the thorax and abdomen, are such that separate views of their affections, however they may carry the appearance of minute accuracy along with them, are more the objects of speculative calculation in the closet than the results of actual experience, and can seldom be of any practical utility in the field or hospital." *Op. cit.* 3d ed., p. 361.

CASE.—Private Joseph Hollinger, Co. G, 6th Maryland Volunteers, aged 32 years, was wounded at Winchester, Virginia, September 19th, 1864, by a conoidal ball, which entered about one-half an inch above and slightly to the right of the median line of the thyroid cartilage, and emerged from the top of the left shoulder, three inches above the spine of the scapula and four inches to the left of the spine. He was taken to the hospital of the 3d division, Sixth Corps, and, on September 27th, sent to the hospital at Frederick, Maryland. Simple dressings were applied. On November 18th, he was transferred to the Mower Hospital, Philadelphia, and, on January 26th, 1865, to Turner's Lane Hospital. While at Mower Hospital, electricity had been applied, which caused great pain. On admission to Turner's Lane Hospital, his general health was good; there was partial paralysis of the arm, with slight atrophy; galvanism was applied daily to the arm. On May 24th, he was transferred to McClellan Hospital. Friction was applied, and the arm rubbed with liniment. He was discharged from service on June 10th, 1865, at which time he had recovered from paralysis. He is not a pensioner.

CASE.—Private William Hunter, Co. F, 5th Maryland Volunteers, received, at the battle of Antietam, Maryland, September 17th, 1862, a gunshot wound of the neck, the missile entering about an inch and a half below the right ear and emerging a little above the seventh cervical vertebra. He was taken to the hospital of the 3d division, Second Corps. On January 14th, 1863, he was admitted to Carver Hospital and discharged from service on March 30th, 1863. Pension Examiner H. W. Owings reports, January 24th, 1867, that the right arm is almost completely paralyzed.

CASE.—Private T. D. Pomeroy, Co. E, 68th Ohio Volunteers, received a gunshot wound of the neck at Champion Hills, Mississippi, May 16th, 1863, the ball entering below the right jaw and lodging near the vertebra of the neck. He was treated in field hospital until June 24th, 1863, when he was conveyed to Memphis, Tennessee. On July 9th, he was admitted to the City Hospital, St. Louis, and transferred to Jefferson Barracks, Missouri, July 24th, 1863, at which time there was partial paralysis of the whole system. He was discharged from service on August 14th, 1863. Pension Examiner William Ramsey reports, September 29th, 1863, that the spinal marrow has been injured to such an extent as to produce paralysis of the upper extremities, more especially the right arm. His speech was also affected.

CASE.—Private Sylvester Dearstyne, Co. F, 44th New York Volunteers, received a gunshot wound of the neck at Bull Run, Virginia, August 30th, 1862. The missile entered at the centre of the right sterno-cleido-mastoid muscle and lodged. He was admitted, on the next day, to Fairfax Street Hospital, Alexandria. On September 16th, he was furloughed for thirty days, and reporting, at the expiration of his leave, to Ira Harris Hospital, Albany, New York, was discharged from service on November 10th, 1862, at which time there was paralysis of the right arm. He is not a pensioner.

CASE.—William Benson, a seaman attached to the steamer Commodore Perry, was admitted into the Post Hospital at Plymouth, North Carolina, May, 1st, 1863, with a gunshot wound of the neck. The missile having entered immediately above the clavicle at the junction of its external and middle thirds, passed backward and emerged near the spine of the scapula, at the superior angle of the bone, injuring, in its passage, the branches of the brachial plexus distributed over the arm and shoulder. Simple dressings were applied. Paralysis of the muscles of the arm and shoulder resulted. He was discharged from service on November 3d, 1863. He is a pensioner.

CASE.—Private John Hartman, Co. E, 15th New York Heavy Artillery, aged 24 years, was wounded on the South Side Railroad, Virginia, April 1st, 1865, by a conoidal ball, which entered just beneath the angle of the left inferior maxilla, passed downward and backward, and emerged over the spinous process of the third cervical vertebra. He was treated in field hospital until April 5th, when he was sent to Lincoln Hospital, Washington. On May 23d, he was sent to Summit House Hospital, Philadelphia, whence he was discharged from service on June 15th, 1865. Pension Examiner W. M. Chamberlain reports, May 2d, 1869, that the brachial plexus was probably injured, as the arm is semi-paralyzed and feeble.

CASE.—Private *G. Bowen*, Co. D, 51st North Carolina, aged 31 years, was wounded near Richmond, Virginia, May 10th, 1864, by a conoidal ball, which entered at the top of the sternum and emerged at the internal superior portion of the left scapula, passing through the neck. He was admitted, on the same day to the Chimborazo Hospital, Richmond. An abscess formed near the wound of entrance about one week after admission, which was opened. Cold applications were applied. There was paralysis of the left arm and leg. On May 22d, small abscesses appeared in the leg of wounded side. Death resulted on June 25th, 1864. The autopsy revealed both wounds healed; the track of the wound was found occupied by clotted blood.

CASE.—Private Patrick Norton, Co. D, 70th New York Volunteers, was wounded at Bull Run, Virginia, by a pistol ball, which entered near the right primitive carotid artery, and emerged near the inferior border of the scapula on the left side. He was admitted, on the next day, to the Presbyterian Church Hospital, Georgetown, D. C. The patient was somewhat exhausted when admitted, but rallied under the use of stimulants. Respiration was easy. Cold water dressings were applied and anodynes given. During the night the patient was extremely restless, continually calling for water, and wishing to have his position changed. The pulse was full and bounding. There was paralysis of the upper and lower extremities, consequent upon the severing of some of the nerves involved in the wound. There was also paralysis of the sphincters of the bladder and rectum, the fæces and urine being voided involuntarily. Great irritability of the stomach was a constant symptom, it being impossible for the patient to retain food or medicine for more than fifteen minutes. Involuntary emissions of semen occurred nearly every two hours. The patient finally became so noisy and troublesome that it was necessary to have him isolated. He continued in this condition until September 16th, when he began to sink, and died on September 20th, 1862.

CASE.—Private Henry Graff, Co. I, 7th Massachusetts Volunteers, aged 30 years, received, at Fredericksburg, May 2d, 1863, a gunshot wound of the neck, left side, just above the clavicle. He was conveyed to the hospital of the 3d division, Sixth Corps, and transferred to Washington, where he was admitted into the Lincoln Hospital on June 15th. On the 16th, he was transferred to the Camden Street Hospital, Baltimore, where he was admitted on the same day. On July 2d, he was transferred to Hammond Hospital, Point Lookout, whence he was returned to duty on June 14th, 1864. On September 3d, 1864, Examining Surgeon George Stevens Jones stated that a fistulous opening existed, and that his left arm was nearly powerless and useless.

CASE.—Private F. B. Smith, Co. B, 17th Michigan Volunteers, aged 27 years, received, on May 6th, 1864, a gunshot wound of the upper third of the neck, posteriorly. He was, on May 25th, admitted to Campbell Hospital, Washington. The patient had total paralysis of the right hand, and partial of the left. He died on June 2d, 1864.

CASE.—Private James Carson, Co. G, 95th Pennsylvania Volunteers, aged 19 years, received, at Spottsylvania, on May 12th, 1864, a gunshot wound of the neck. The missile, a conoidal ball, entered one and a half inches to the right of the seventh cervical vertebra, passed diagonally through and emerged just below the inferior maxilla, one inch from its angle, carrying away a small spicula of bone, involving the nerves and destroying, to some extent, the deep muscles of the side of the neck. The patient fell paralyzed on the reception of the wound, and was unable to move his limbs for half an hour, but he gradually regained the use of the lower extremities and the left arm, on the following day. He was, on May 25th, admitted to Harewood Hospital, Washington, and, on the 31st, transferred to Philadelphia, where he was admitted into the Convalescent Hospital. Simple dressings were applied to the wound. On June 22d, he was transferred to the Turner's Lane Hospital, where, on September 5th, a small piece of necrosed bone was removed. He was discharged the service on December 9th, 1864, and pensioned.

CASE.—Private William H. Curtis, Co. A, 78th Illinois Volunteers, aged 28 years, was wounded at the battle of Jonesboro', September 1st. 1864, by a conoidal ball, which entered the left side of the neck, one inch anterior to the sterno-cleido-mastoid muscle, at a point midway between the sternum and the inferior maxilla, and lodged about the centre of the scapula on the anterior side. He was, on November 26th, admitted to Brown Hospital, Louisville, Kentucky, and thence transferred to Mound City Hospital, Illinois, December 1st. Simple dressings were applied to the wound. The wounds had healed December 13th; there was partial paralysis of the arm and hand, and all the muscles of the shoulder were partially atrophied. The patient was unable to raise his hand to his face, and had some constant pain in his shoulder. He was discharged the service March 11th, 1865. The case is reported by Surgeon Horace Wardner, U. S. V. Curtis is a pensioner; his hand is completely disabled and stiff. His disability is total and permanent.

CASE.—Corporal Ralph White, Co. E, 9th Pennsylvania Reserves, received at the battle of Drainsville, December 20th, 1861, a gunshot wound of the neck. A ball entered a few inches to the right of the fourth cervical vertebra and lodged. The wound healed and he performed duty until the middle of January, 1863, when he commenced to suffer from severe pain. He was discharged from service March 9th, 1863, and pensioned. Pension Examiner G. McCook reports that there is partial paralysis of the right shoulder, caused by ball pressing on the nerves. Disability one-third.

CASE.—Private David Campbell, Co. F, 29th Pennsylvania, aged 31 years, was wounded at Gettysburg, Pennsylvania, July 3d, 1863, by a conoidal ball, which entered the left side of the neck; passed directly downward through the edge of the trapezius muscle into the cavity of the thorax, where it lodged. He was admitted, on October 25th, to Satterlee Hospital, Philadelphia. Simple dressings were applied to the wound; the ball was unsuccessfully searched for. The transverse process of the fifth cervical vertebra, being found necrosed, was removed. The wound granulated finely, and by November 22d, had almost healed. He was transferred to the Veteran Reserve Corps, December 31st, 1863. Pension Examiner Thomas H. Hope reports, July 16, 1869, that the pensioner complains of frequent shooting pains through the chest and along the left arm to the elbow, the use of which is impaired. On the same day that he received the above injury he was ridden over by the enemy's cavalry, receiving extensive wounds of the thigh, which ulcerated. The limb is much enlarged.

CASE.—Private Frederick Gening, Co. H, 100th New York Volunteers, was admitted to Ira Harris Hospital, Albany, New York, October 4th, 1862, with seven gunshot wounds, supposed to have been received at the battle of Fair Oaks, Virginia, May 31st, 1862. One missile entered midway between the two scapulas over the seventh cervical vertebra, disappearing and wounding or pressing upon the right axillary plexus of nerves. During the treatment of the case one ball was extracted. He was discharged from service November 10th, 1862. There was total paralysis of the right arm. Horatio N. Loomis, Pension Examiner, reports, May 27th, 1864, that the right arm was almost useless, and that he suffered pain in right side and chest.

CASE.—Captain John Foster, Co. D, 111th Illinois Volunteers, aged 35 years, was wounded at Fort McAllister, December 13th, 1864, by a conoidal ball, which entered at the middle of the upper third of the left humerus, ranged upward and inward, passed through the deltoid muscle anterior to the bone, through the axilla, beneath the clavicle at its middle, and thence through the neck, emerging at the posterior edge of the sterno-cleido-mastoid muscle of the right side, wounding, in its track, the brachial plexus and destroying sensation in the ulnar side of the arm. He was admitted, on December 26th, to the Officers' Hospital, Beaufort, South Carolina, whence he was discharged from service on December 30th, 1864. Pension Examiner W. H. Castle reports that the pensioner suffers from constant dyspnœa and partial loss of voice.

CASE.—Private Charles C. Ewer, Co. D, 44th Massachusetts Volunteers, aged 23 years, was wounded while in the act of firing, at Whitehall, North Carolina, December 16th, 1862, by a round musket ball, which entered at the inferior border of the thyroid cartilage just to the right of the median line, passed backward and outward, and emerged over the right scapula about an inch from its superior angle posteriorly and near its spine. On the reception of the injury the arm fell, and he suffered great pain for about one month, during which time the arm, forearm, and hand were very sensitive, the slightest contact causing intense pain. The power of speech was lost entirely for six weeks. The limb was carried at right angles, and sulphate of morphia exhibited hypodermically to relieve the pain. He was admitted to the hospital at New Berne, North Carolina, December 21st, 1862. The wounds of entrance and exit healed by February 5th, 1863, and never broke out again. At this date he was transferred to his home in Boston, Massachusetts, where he was treated by Dr. Gay. The pain abated gradually, and in six months he was able to bear some friction with the palm of the hand on the surface of the limb. Passive motion of the arm, which had become somewhat fixed, was continued daily, with friction, for about a year, when he was able to carry a light cane. He was discharged from the service on May 6th, 1863. H. W. Sawtelle, M. D., reports, under date of November 26th, 1870, "the limb is now normal in size, but the fingers are quite sensitive in cold and damp weather. He states that after much exertion, and pronating and supinating the limb, a sharp pain is experienced in the thumb and index finger." Mr. Ewer is a clerk in the Treasury Department. He is a pensioner.

CASE.—Private *J. H. McCullough*, Co. F, 59th Alabama Regiment, aged 27 years, was wounded near Richmond, Virginia, May 16th, 1864, by a conoidal ball, which passed transversely through the neck from the right side, one and a half inches below the thyroid cartilage, perforating the trachea. He suffered from aphonia until June 5th, 1864, when he was furloughed, at which time both orifices were entirely healed.

CASE.—Corporal *Robert T. Arnold*, Co. A, 4th Georgia Regiment, was wounded on May 8th, 1864, by a conoidal ball, which entered about the middle of the sterno-cleido-mastoid muscle, left side, and emerged at the middle of the right clavicle, wounding the larynx in its course. He was conveyed to the Confederate hospital at Farmville, Virginia, The treatment in the case has not been recorded. The injury resulted in aphonia. He was furloughed on July 18th, 1864, for sixty days. On February 25th, 1865, he was admitted into the Jackson Hospital at Richmond, Virginia, whence he was returned to duty on February 28th, 1865.

CASE.—Private William L. Switzer, Co. F, 5th Iowa Volunteers, aged 25 years, was wounded at Iuka, September 19th, 1862, by a musket ball, which struck the larynx near its centre, just below the left portion of the lower jaw, passed through it and emerged at the edge of the sterno-cleido-mastoid muscle, about three inches below the angle of the jaw; another ball struck near the acromion process of the right shoulder in front, passed under the upper portion of the humerus, and out about four inches below the head of the bone, near the external edge of the deltoid muscle. He was, on October 19th, admitted to Keokuk Hospital, Iowa. On March 31st, 1863, he could not speak aloud, and probably never would; he was pale and sickly looking, and had the appearance of a person whose general health was broken down. He was discharged the service on December 20th, 1862. The case is reported by Examining Surgeon Oramel Martin.

CASE.—Corporal Valentine Stork, Co. I, 5th Pennsylvania Cavalry, received, at Williamsburg, September 9th, 1862, a gunshot wound. The missile entered the right side of the neck, passed under the sterno-mastoid muscle, through the trachea, and emerged at the left side above the sternum. He was, on September 10th, admitted to Nelson Hospital, Yorktown, Virginia. He was discharged the service on November 28th, 1862. Examining Surgeon G. McCook, by whom the case was reported, states that Stork's voice was almost suppressed, and his breathing impaired.

CASE.—Private Joseph Phillips, Co. F, 7th West Virginia Volunteers, aged 30 years, received a gunshot wound of the neck at Antietam, Maryland, September 17th, 1862, the missile entering on the left side under the sterno-mastoid muscle, opposite pomum Adami, and emerging at the superior angle of the scapula. He was treated in field hospital until the 27th, when he was admitted into Satterlee Hospital, Philadelphia. He was discharged from service on November 28th, 1862, at which time the wound had healed; there was loss of vision and entire paralysis of the left arm. The Pension Examining Board at Wheeling, Virginia, reports, May 8th, 1870, that there is atrophy of the left arm, with partial loss of motion.

CASE.—Private *John A. White*, Co. A, 31st Missouri, received a gunshot wound of the neck, right side, at Vicksburg, Mississippi, December 29th, 1862. He was admitted to hospital at Benton Barracks, St. Louis, June 29th, 1863, and was discharged the service on October 22d, 1863, for total deafness. His disability is rated one-half.

CASE.—Private *George Peake*, of Sturdevant's Battery, was struck by a ball, which passed through the concha of the right ear and emerged near the first cervical vertebra. He was admitted to Farmville (Confederate) Hospital. There ensued entire loss of hearing on the injured side, and the patient suffered from neuralgic pains.

Hæmorrhage.—Of cases in which primary or secondary hæmorrhage was the principal feature, the following may be cited:

CASE.—Major Richard Lanning, 80th Ohio Volunteers, received, at Corinth, October 3d, 1862, a gunshot wound. The missile passed through the neck just in front of the carotid artery. He died on the field, from hæmorrhage, on October 3d, 1862. The case is reported by Surgeon E. P. Buell, 80th Ohio Volunteers.

CASE.—Private Edward B. Taylor, Co. I, 6th Connecticut Volunteers, was wounded at Fort Wagner, South Carolina, July 18th, 1863, by a fragment of shell, which struck at the base of the neck, tearing open the branches of the thyroid axis and the jugular vein. He was admitted, on the next day, to Hospital No. 8, Beaufort, where styptics and compresses were applied. It was decided that to operate upon him would hasten his death on account of hæmorrhage. He died on July 27th, 1863.

CASE.—Colonel John J. Mudd, 2d Illinois Cavalry, received a gunshot wound of the neck, in June, 1863, by being fired at from an ambush, near Vicksburg, Mississippi. The missile, a buckshot, entered near the inferior orbital foramen, passed downward and backward behind the angle of the lower jaw, wounding the parotid gland, and lodged deeply in the neck, probably under the sterno-cleido-mastoid muscle. Simple dressings were applied. The wound produced great swelling in the fauces and difficulty of deglutition, with some hæmorrhage from the mouth. He was furloughed, and having returned to duty was subsequently killed in action on the steamer City Bell, on May 3d, 1864.

CASE.—Sergeant Eugene Wilcox, Co. E, 10th Connecticut Volunteers, aged 30 years, was wounded at Whitehall, North Carolina, December 16th, 1862, by a conoidal ball, which entered just above the right clavical, and, traversing the neck, passed out immediately below the spinous process of the seventh cervical vertebra. He was treated in the field hospital until December 21st, when he was admitted into Stanley Hospital, New Berne, North Carolina. Simple dressings were applied, and tonics, stimulants, and nutritious fluids administered. On December 24th, there was external hæmorrhage to a considerable extent, which recurred on the 28th. It was decided that operative interference could afford no relief. Death resulted in a few hours after the recurrence of the hæmorrhage, on December 28th, 1862. The autopsy revealed a wound of one of the important branches of the thyroid axis and of the external jugular vein, with sloughing of the neighboring integument.

CASE.—Sergeant *J. W. J. Junks*, Co. D, 28th Mississippi Cavalry, was wounded at Franklin, Tennessee, April 10th, 1863, by a conoidal ball, which entered opposite the thyroid cartilage, at the inner border of the sterno-mastoid muscle, and emerged about an inch and a half to the left of the lower cervical vertebra. He was taken prisoner, and admitted to the hospital

at Franklin on the same day. He lost, in the course of three hours, perhaps two quarts of blood, after which the hæmorrhage ceased. On the second day, he was taken with severe chills, which recurred at the rate of two or three a day, followed by high febrile reaction. Death resulted on April 16th, 1863. The autopsy showed that the jugular vein had been completely severed. The surrounding tissues were extensively infiltrated with pus and blood, and the divided extremities of the vein contained a large amount of pus.

Case.—Captain Jarvis N. Lake, Co. B, 93d Ohio Volunteers, aged 31 years, was wounded at Missionary Ridge, November 23d, 1863, by a musket ball, which entered the right side of the neck, on a level with the pomum Adami, passed between the jugular vein and carotid artery in a direction downward and backward, and emerged one inch and a half below and one inch to the right of the last cervical vertebra. He remained senseless for hours, and was supposed to be dead; signs of life appearing, he was conveyed to the field hospital, where he recovered from the severe nervous shock which he had sustained. Severe hæmorrhage occurred. On December 18th, he was admitted into the field hospital, Bridgeport, Alabama. Cold water dressings were applied to the wound, and restoratives administered. He was transferred to Nashville on December 22d. Pension Examiner E. Mendenhall states, on January 4th, 1864, that "the patient's wounds are healed, but the side of the neck, the entire shoulder, and arm of the right side are very sore, swollen, and paralyzed." On a subsequent examination, the soreness and swelling were gone, and the patient could use his forearm and hand; some of the muscles of the shoulder were atrophied. His general health was good.

Case.—Private *Joseph Step*, Co. I, 40th Georgia Volunteers, aged 29 years, received, May 20th, 1864, a gunshot wound. The missile entered just below the angle of the right inferior maxilla, passed through the neck, and emerged at a corresponding point on the left side; the same ball also fractured the left humerus. He was admitted to Institute Hospital, Atlanta, where amputation at the upper third of the left arm was performed. The patient was weak from loss of blood; there was considerable constitutional disturbance. Secondary hæmorrhage occurred from the wounds of the neck on June 7th. The patient died on June 8th, 1864.

Case.—Private Big Jim, Co. M, 6th Kansas Cavalry, received, in a brawl on July 4th, 1864, a gunshot wound of the neck, by a conoidal ball, which entered above the outer third of the right clavicle, and emerged above the middle third of the left clavicle. He was, on July 4th, admitted to Fort Smith Hospital, Arkansas. Simple dressings were applied to the wound. Secondary hæmorrhage from the common carotid artery occurred on July 11th, which was temporarily controlled by the application of the solution of persulphate of iron. The patient died on July 12th, 1864. The autopsy revealed an aperture in the carotid, about two lines in diameter, and about three-fourths of an inch above its origin.

Case.—Corporal Jacob Brandt, Co. D, 142d Pennsylvania Volunteers, aged 31 years, was wounded at the Wilderness, May 6th, 1864, by a fragment of shell, which entered at the right side of the face, on a level with the lower margin of the inferior maxilla, and one inch in front of the condyle, passed backward and downward, and emerged between the scapula over the spinal column. He was, on May 11th, admitted to Armory Square Hospital, Washington. Stimulants were administered, and generous diet ordered. The patient had frequent chills, and all the symptoms of pyæmia, and was very much exhausted. Secondary hæmorrhage, which was slight, occurred on June 3d, from an ulceration of the external jugular vein. He died on June 3d, 1864. The case is reported by Surgeon D. W. Bliss, U. S. V.

Case.—Private Alonzo Hoyt, Co. I, 14th Michigan Volunteers, was admitted from the field into hospital No. 1, Nashville, on January 4th, 1863, for a gunshot wound of the neck, received at the battle of Murfreesboro', on the 3d. The missile had passed through the neck, dividing the intervertebral muscles and laying open the spinal cord. He did not seem to suffer much, but on the night of January 14th, secondary hæmorrhage supervened, and, before any assistance could be rendered, he lost so much blood that he died on the evening of January 15th. At the *post-mortem*, it was found that sloughing of the common carotid artery had taken place. No paralysis occurred, or anything to mark the extent of the injury. He conversed freely up to the moment of his death. The case is reported by Surgeon Edward Batwell, 14th Michigan Volunteers.

Few writers on military surgery have failed to remark on the curious manner in which missiles elude the great vessels of the neck, though passing, apparently, in their immediate track. The examples of this description reported were numerous. Dr. Williamson,* 64th British Regiment, suggests an explanation of this phenomenon.

Erysipelas after Neck-wounds.—The liability of gunshot injuries, especially of this region, to be complicated by erysipelatous action is often noticed in the reports. One or two cases of recovery are appended. Without other complications, this was rarely fatal. Indeed, in healthy subjects traumatic erysipelas is not commonly a very serious affair. Tonics, and especially iron in the form of tincture of the sesquichloride, were usually employed:

Case.—Private Charles Guttery, Co. D, 140th Pennsylvania Volunteers, aged 18 years, received, at Spottsylvania, May 12th, 1864, a gunshot wound of the upper and posterior part of the neck. He was, on May 15th, admitted to Lincoln Hospital, Washington, and, on the 18th, transferred to Pennsylvania, where he was admitted into the York Hospital, May 21st. Simple dressings were applied to the wounds. Erysipelas set in, which covered the entire face and scalp. On June 13th, he was transferred to the Pittsburg Hospital, whence he was returned to duty on September 22d, 1864.

* "It is remarkable that the large arteries and veins in the neck should escape injury so frequently in gunshot wounds. This may, in some measure, be accounted for by the structures in this region being so loose and movable that they yield or recede before any projectile." Williamson, *Op. cit.* p. 72.

Case.—Private John H. Betts, Co. H, 120th New York Volunteers, was wounded at Gettysburg, July 2d, 1863, by a musket ball, which entered at a point over the scalenus medius of the left side, one inch above the clavicle, passed through the neck, and emerged at a corresponding point on the right side. He was, on July 5th, admitted to Satterlee Hospital, Philadelphia. On admission, the parts were erysipelatous, and the patient had some difficulty of swallowing. He stated that after the reception of the injury, he spat blood for several days. Flaxseed poultices were applied to the wound, and perfect rest was ordered. The wounds discharged pus freely, but the matter burrowed into the supra-sternal fossa, which being emptied, soon granulated, and the wounds healed readily, with some inclination of the head forward from a rigidity of the anterior muscles of the neck. He was returned to duty on September 23d, 1863. The case is reported by Acting Assistant Surgeon T. G. Morton. The name of this patient does not appear on the Pension List.

Another case (*Hayes*, 6th Alabama) is detailed on page 405.

Sloughing and Gangrene.—Wounds of the neck were seldom affected with sloughing Perhaps the looseness of the textures was a safeguard against this complication. At all events, the few instances observed were in the region of the denser tissues. One or two abstracts may be cited:

Case.—Private John McCafferty, Co. I, 114th Pennsylvania Volunteers, aged 23 years, received a gunshot flesh wound of the right side of the neck by a conoidal ball, at Gettysburg, July 2d, 1863. He was taken to the hospital of the 1st division, Third Corps, and on July 7th, sent to Mower Hospital, Philadelphia. When admitted the wound was unhealthy and painful, with a tendency to slough. Cold-water dressings were applied to the wound, with stimulants internally. By July 13th, the slough extended over a surface four inches in length by three inches in width. The patient was very weak, and the pain continued. On the same day a portion of the slough was removed with the scalpel, and a solution of creasote applied. By July 21st, the appearance of the wound was much improved and granulating. The slough was all cleaned off. The patient continued to improve, and was returned to duty October 22d, 1863, at which time the wound had entirely healed. He is not a pensioner.

Case.—Private Frank Eastman, Co. D, 6th New Hampshire Volunteers, aged 18 years, was wounded before Petersburg, Virginia, April 2d, 1865, by a fragment of shell, which entered near the spinous process of the seventh cervical vertebra and emerged in front of the ear on the right side. He was treated in field hospital, and, on the 4th, transferred, per steamer Cosmopolitan, to Washington, entering Harewood Hospital on the 5th. The wounds of entrance and exit were greatly lacerated, and in a sloughing condition. After the eschars separated, he steadily improved, from the first, without any apparent constitutional disturbance, the wound discharging healthy pus and granulating finely. On May 15th, he was transferred to Webster Hospital, Manchester, New Hampshire, whence he was discharged from service on July 24th, 1865. Pension Examiner C. H. Boynton reports, November 13th, 1865, that the patient suffers from deafness in the right ear, and pain and dizziness. There was a daily discharge of matter from the mouth, coming through the right Eustachian tube. He was unable to labor. The appearance of the wounds, on admission, are imperfectly represented in the wood-cut (Fig. 185), a reduced copy of an excellent photograph.

Fig. 185.—Sloughing shell-wound of neck. *Phot. of Surg. Cases*, A. M. M., Vol. I, p. 21.

Pyæmia.—Purulent infection occurred as an occasional sequel of wounds of the neck, but was not a frequent complication. Of the few cases reported in detail, the notes of the autopsies are, unhappily, incomplete. The following memoranda are placed on record:

Case.—Private John Gilman, Co. G, 12th New Hampshire Volunteers, aged 31 years, was wounded at Chancellorsville, May 3d, 1863, by a musket ball, which grazed the ramus of the inferior maxilla, near the angle of the left side, and entered the neck above the sterno-clavicular articulation of the right side, and passed to some point not ascertained. He was, on May 9th, admitted to Harewood Hospital, Washington. Cold water dressings were applied to the wound; stimulants were administered, and generous diet ordered. On May 14th, the patient had some cough, expectoration of a yellowish tenacious sputa, and crepitus in the apex of the right lung. On the 15th, he had chills and fever; on the 23d, restless; pulse frequent; slight venous hæmorrhage. The patient died on May 23d, 1863. The *post mortem* examination revealed an abscess like an egg, in the spleen, which was eight inches, by four inches wide. Black gangrenous congestion in several patches in the lower lobe of the right and left lungs. The case is reported by Acting Assistant Surgeon Hirshfield.

Case.—Sergeant John Parker, Co. G, 39th, New York Volunteers, aged 30 years, received, at Ream's Station, August 25th, 1864, a gunshot wound of the neck. The missile, a conoidal ball, entered over the sterno-cleido-mastoid muscle, on a line with the inferior edge of the thyroid cartilage and lodged, fracturing the first rib. He was conveyed to the hospital of the 1st

division, Second Corps, and transferred to Washington, where he was admitted into the Lincoln Hospital on August 28th. The ball was removed from near the first rib; stimulants were administered, and nutritious diet ordered. On August 30th, there was a constant discharge of sanguineus liquor from the wound, which was arrested by compression and bandages. The patient was pale and anæmic; on September 2d, had chills; sallow look; the surface of the body covered with a profuse perspiration. Pyæmia supervened, and the patient died on September 13th, 1864. The autopsy revealed fifty ounces of fluid in the left thoracic cavity; a large abscess in the left lung, and a small one in the right. The case is reported by Acting Assistant Surgeon W. E. Roberts.

CASE.—Musician Samuel Potter, Co. K, 43d United States Colored Troops, aged 17 years, received, on July 30th, 1864, an accidental gunshot wound of the neck, by a pistol ball. He was, on July 31st, admitted to Summit House Hospital, Philadelphia. Simple dressings were applied to the wound; tonics and stimulants administered, and generous diet ordered. On August 10th, pyæmia supervened. The patient died on August 13th, 1864.

The following table is a consolidation, from all the reports received, of gunshot wounds of the neck. The mortality is 15 per centum. But it must be understood that the figures were taken from the casualty lists and regimental field reports, as well as from the returns of the field, and base, or general hospitals. And thus the excessive ratio of mortality is explained. Many cases are included of grave injuries that never came under treatment:

TABLE XVII.

Table of Four Thousand Eight Hundred and Ninety-five Cases of Gunshot Wounds of the Neck without Known Injury to the Cervical Vertebræ.

CHARACTER OF WOUND.	Cases.	Died.	Discharged.	Duty.	Unknown.
Gunshot Wounds of the Neck	4789	570	1056	2394	769
Gunshot Wounds of the Neck, injuring Trachea	41	21	11	8	1
Gunshot Wounds of the Neck, injuring Larynx	30	10	8	2	10
Gunshot Wounds of the Neck, injuring Pharynx	13	7	2	3	1
Gunshot Wounds of the Neck, injuring Œsophagus	10	6	2	2	.....
Gunshot Wounds of the Neck, injuring Trachea and Larynx	4	.....	1	3	.....
Gunshot Wounds of the Neck, injuring Trachea and Pharynx	2	.....	2	.....	.....
Gunshot Wounds of the Neck, injuring Trachea and Œsophagus	2	2	.....	.....	.....
Gunshot Wounds of the Neck, injuring Larynx and Œsophagus	1	.....	1	.....	.....
Gunshot Wounds of the Neck, injuring Pharynx and Œsophagus	1	.....	.....	1	.....
Gunshot Wounds of the Neck, injuring Pharynx and Larynx	2	2	.....	.....	.....
Aggregates	4895	618	1083	2413	781

Section III.

OPERATIONS ON THE NECK.

The following table presents a numerical exhibit of the principal cases in which operative interference was resorted to on account of injury or disease in the cervical region:

Table XVIII.

Table of One Hundred and Thirty-eight Operations for Gunshot Wounds and Surgical Diseases of the Neck.

CHARACTER.	Cases.	Died.	Discharged.	Duty.	Unknown.
Ligations	29	22	2	4	1
Tracheotomy	14	8	4	2	.....
Laryngotomy	6	5	1	.....	.....
Excision of Tonsils	2	.....	2	.....	.....
Removal of Balls	87	12	36	29	10
Aggregates	138	47	45	35	11

Operations on the Air-passages.—Of the twenty cases of bronchotomy reported, six were operated on because of gunshot wounds, and two of these had a successful issue. The abstracts are appended,—to be followed by those of the operations performed for disease:

Case.—Captain John S———, 53d Pennsylvania Volunteers, aged 24 years, was admitted to Jarvis Hospital, Baltimore, July 5th, 1863, having been wounded at Gettysburg on July 2d. He states that he received a wound of the neck, which bled so profusely that he had to be carried to the rear, where simple dressings were applied. The hæmorrhage continued for some hours, and finally stopped of its own accord. At nine o'clock A. M., on the day of admission, he was found bright, breathing easy, pulse 96, and able to converse without difficulty. There was excessive swelling about the neck; the wound had closed, and no emphysema existed. The patient reported that for two days air had escaped from the wound at each expiration, but now it had entirely ceased. The wound (supposed to have been made by a buckshot) is located over the centre of the left plate of the thyroid cartilage, is about one-fourth of an inch in length, and its course is directly backward. Where the shot lodged could not be ascertained, but it must have passed through the larynx. The patient's symptoms after admission soon became alarming. He fell asleep in a sitting posture, and dyspnœa was most marked. At twelve o'clock M. his pulse had increased to 116; breathing was more labored; the chest and face were covered with a cold perspiration, and his expression was extremely anxious—symptoms indicating a critical condition and demanding active steps to be taken. The swelling and œdema around the seat of injury, both internally and externally, were rapidly on the increase; emphysema had set in, and extended down the chest, especially on the left side, as far as the false ribs. A consultation of surgeons was held, and it was decided to perform tracheotomy. The instruments selected for the operation not being at hand, they were kindly furnished by a distinguished surgeon of Baltimore. A straight incision, commencing over the cricoid cartilage, was made and carried downward in the direction of the median line for about one and a half inches through the integuments. The thyroid gland being exposed was found greatly distended and infiltrated with air, fibrin, and bloody serum, as indeed were all the tissues. Carefully dissecting

the parts on a grooved director, the lower edge of the cricoid cartilage and the upper ring of the trachea were finally reached. A grooved tenaculum was hooked through the trachea just below the cricoid cartilage, and held firm by the hands of an assistant, with the handle resting on the patient's chin. A narrow, sharp-pointed knife, guided by the groove of the tenaculum, was then inserted to perforate the trachea, which, owing to its unusual and great thickness caused considerable impediment to the first attempt. The length of the blade passed out of sight without accomplishing the object, and the patient uttered a complaint of too much pressure. The tenaculum was still steadily held while further dissections and slight enlargement of the bottom of the incision were made. The second attempt proved less difficult, and was immediately followed by the escape of bubbles of air. The fresh wound was thoroughly cleansed, and through the opening a blunt-pointed narrow knife was passed and carried downward and forward until at least three rings of the trachea had been divided. Very little blood escaped into the trachea, and one or two explosive efforts cleared it of these small clots and a quantity of tough mucus, and the patient breathed easily through the new opening. The operation was completed by introducing a large-sized Dessault's tube, which was properly retained in position in the usual manner. No ligatures were required, and the amount of blood lost was insignificant. The relief experienced by the patient was instantaneous, and a change for the better in all his alarming symptoms was immediately noticed. His pulse fell to 96, and he was soon enjoying a pleasant sleep. July 6th. The patient's condition is much improved, the swelling is subsiding, and the wounds look healthy. The treatment consists in keeping the patient quiet, giving him flaxseed tea to drink, and fluid nourishment. July 9th. The patient continues to improve, and as the swelling of the neck has entirely disappeared, the tube was removed and left out. He was watched closely, and on the following day he commenced breathing freely through the natural passages. July 18th. The wounds have almost healed, the patient walks about, and his voice is as strong as ever. Being anxious to return to his home, he was discharged cured. The operation performed in this case is the one recommended by M. Chassaignac. The steps of the operation were not familiar to me, and I am indebted to Dr. Christopher Johnson, of Baltimore, for its adoption. I consider it preferable to any I have witnessed, and should judge it was particularly applicable in children, where it is all important to retain the larynx and trachea under perfect control during their struggles. The operation was conjointly performed by Dr. Johnson and myself, and I have been truly pleased with the result. [The case is reported by the operator, Assistant Surgeon De Witt C. Peters, U. S. A. On April 7th, 1864, Pension Examiner H. P. Moody stated that the wound had seriously affected the air passages and might lead to confirmed tuberculosis. There appears to be no later records of this patient at the Pension Office.]

Case.—Private John H. Murphy, Co. D, 30th Illinois Volunteers, was wounded at Black River Bridge, May 3d, 1863, by a musket ball, which entered the superior portion of the larynx, passed downward, backward, and outward through the superior angle of the left scapula, injuring the sheath of the carotid artery. On May 4th, he was admitted to Mary Anne Hospital, Mississippi, almost moribund; had dyspnœa, and great difficulty of deglutition. Cold water dressings were applied to the wound. On May 6th, Acting Assistant Surgeon C. B. Miller performed the operation of laryngo-tracheotomy. The patient died on May 6th, 1863. The *post-mortem* examination revealed great extravasation of blood upon the pneumogastric nerve, which was purple, and within the sheath of the carotid artery. The case is reported by the operator.

Case.—Private Lysander Martin, independent company, Andrew's Massachusetts Sharpshooters, aged 28 years, was wounded at Fredericksburg, June 10th, 1863, by a conoidal ball, which entered the neck three-fourths of an inch under the left ear, passed through the root of the tongue, and emerged through the middle of the right cheek. On June 14th, he was admitted to Hammond Hospital, Maryland, suffering much from pharyngitis, difficulty of deglutition, and very distressing dyspnœa. Cold water dressings were applied to the wound, and liquid diet administered by means of the stomach pump. On June 19th, Acting Assistant Surgeon T. Liebold performed tracheotomy, and a large quantity of sanguino-purulent matter escaped from the trachea. The immediate relief in breathing was great, but it became soon evident that he could not survive. The patient died on June 19th, 1863. The *post-mortem* examination revealed the pharynx considerably lacerated, epiglottis swollen, and the trachea and bronchia lined with a thick false membrane. The bases of the lungs, gorged with blood, presented an appearance as in red hepatization, and had a few small abscesses in them. The case is reported by the operator.

Case.—Private John Durham, Co. K, 21st New York Cavalry, was admitted to the field hospital at Sandy Hook, Maryland, on July 27th, 1864, having received, two days previously, at the battle of Winchester, Virginia, a gunshot wound, fracturing the neck and perforating the trachea. The soft parts were lacerated, and there was extreme difficulty in breathing; constitutional condition fair. On the day of his admission to hospital, tracheotomy was performed by Assistant Surgeon J. S. Taylor, 23d Illinois Infantry. Subsequent treatment was restorative. The patient died on July 30th.

Case.—Private P. C. Young, Co. I, 3d Massachusetts Cavalry, aged 34 years, was admitted to hospital at Readville, Massachusetts, January 2d, 1865, having received, at Cedar Creek, Virginia, October 19th, 1864, a gunshot wound of the neck, causing aphonia and dyspnœa. A laryngoscopic examination showed great swelling of the superior opening of the glottis, the apparent cause of marked dyspnœa. Difficulty of breathing gradually increased to such an extent, notwithstanding frequent applications of nitrate of silver to the glottis, as to render an operation imperative. On January 5th, the patient was etherized and tracheotomy performed by Acting Assistant Surgeon S. W. Langmaid. The operation was simply a longitudinal incision, as low down in the trachea as possible, and the insertion of a silver tube. Beyond the great congestion of the blood-vessels of that part of the trachea involved in the operation no local lesions were observed (the original wound having healed), and the patient's general condition was good, with the exception of almost complete aphnœa from difficult respiration. The operation was followed by instant relief of the dyspnœa, and rapid recovery of health and strength. The wound healed kindly under the application of tepid water dressings. On March 26th, the original tube was removed and a double fenestrated canula substituted. A laryngoscopic examination showed great swelling and depression of the epiglottis, effectually preventing observation of the parts below. Direct application of glycerine and tannin solution by aid of the laryngoscope resulted in restoring the epiglottis to its normal size and position by March 30th, and the patient was able to articulate distinctly a few words. He still wore the tube. On July 6th, 1865, this man was transferred to Dale Hospital. His name is not on the Pension List.

Case.—Private *W. J. Hindles*, Co. H, 6th North Carolina Regiment, aged 30 years, received a gunshot wound at Winchester, Virginia, September 19th, 1864, the ball entering at the left shoulder, near the spine, and emerging at the symphysis of the lower jaw. He was admitted on the same day to the depot field hospital. On October 1st, he had become anæmic from repeated hæmorrhage. The entire neck in front was distended from diffused clot. Surgeon A. Atkinson, U. S. V., performed tracheotomy on occurrence of asphyxia from pressure of clot on larynx while attempting its removal. He gradually sank from loss of blood and suffocation, impending from diffused clot pressing on trachea, and died on the same day from asphyxia and hæmorrhage. At the autopsy, a diffused clot was found throughout the front and side of the neck, pressing upon the trachea and following in the track of the wound. The transverse processes of the third and fourth cervical vertebræ were found fractured, and the vertebral artery severed.

Bronchotomy for Disease.—Six cases of laryngotomy or laryngo-tracheotomy, and eight of tracheotomy for non-traumatic causes were reported. Of the fourteen cases, one of laryngotomy and four of tracheotomy were successful.

In six of these cases, the operation was performed on account of *œdema of the glottis:*

Case.—Private Samuel Frosh, Co. F, 1st Regiment Potomac Home Brigade, aged 21 years, was admitted to Hospital No. 1, Frederick, Maryland, March 24th, 1864, with pleuro-pneumonia of the left side, from which he made a very favorable recovery, and was able to go out, about April 7th. On April 10th, he complained of a sore throat and very great difficulty in swallowing, occasionally strangling on attempting it. There was tenderness on pressure of the larynx and trachea. Nothing but a very slight redness could be seen in the throat. A gargle was ordered, with hop fomentations. On the 12th, his countenance was anxious, inspiration and respiration obstructed but not laborious. On feeling the epiglottis it was found to be cushiony. It was of a yellowish red color, and shone much as if serum were beneath the mucous membrane. The sides of the fauces were not much reddened. Oedema of the glottis was diagnosed. The treatment consisted of incisions, which were thoroughly made, and the application, externally, of tincture of iodine, with inhalation of vapor from warm water. The incisions gave him great relief. At three o'clock A. M., on the 13th, he had an alarming attack of dyspnœa. The incisions were continued, and the epiglottis and arytæno-epiglottidean folds scarified. At two o'clock P. M., it was decided to operate. Assistant Surgeon R. F. Weir, U. S. A., cut, with the scalpel, down upon and then through the crico-thyroid membrane and cricoid cartilage and one or two rings of the trachea; a double trachea tube was inserted, and a warm moist sponge and folded mosquito netting placed over it. Two teaspoonfuls of blood, mostly venous, were lost. The result was immediate relief, to a remarkable degree, of his respiration and suffering. On May 3d, he was returned to duty; the tube was no longer worn; the granulating surface at the site of the incision was very nearly healed; otherwise, he was perfectly well. He visited the hospital on June 9th, 1864, having returned from a re-enlistment furlough. His voice was still rough and hoarse. In attempting to shout, he emitted a squeaking, high-pitched noise.

The other five operations of this series resulted fatally:

Case.—Private John L——, 1st United States Volunteers, aged 26 years, was admitted to Douglas Hospital, Washington, April 7th, 1865, suffering from an attack of typhoid-pneumonia. He was apparently doing well until the 20th, when he complained of sore throat. On examination, the posterior wall of the pharynx was found to be a little reddened, and covered with an abundance of tenacious mucus. At about 2.30 P. M., on the 25th, he was suddenly seized with great dyspnœa; respiration stertorous, countenance livid, and lips blue. There was complete orthopnœa, with great restlessness and jactitation, and entire inability to speak above a faint lisping whisper. These symptoms continued to increase in severity in spite of the administration of an emetic. A consultation was held, and it was decided that the symptoms were those of œdema of the glottis, and that unless relief were promptly afforded the patient would die of suffocation. Laryngotomy was thereupon performed by Assistant Surgeon William F. Norris, U. S. A., by plunging a narrow straight bistoury into the larynx, just above the cricoid cartilage. The relief was almost instantaneous, and there was but little hæmorrhage. For want of a trachea tube the lips of the wound were kept apart by bent copper wires, which were carried backward and fastened by a piece of tape behind the neck. During the night the patient took sherry wine and beef tea through an elastic bougie, swallowing small quantities at a time. The following afternoon a trachea tube was introduced into the larynx, which rendered the patient much more comfortable, although it was frequently necessary to remove and cleanse the inner tube, which became, from time to time, plugged by the thick and tenacious mucous which was constantly expectorated. On April 28th, there was a feeling of oppression in the chest; all the symptoms of bronchitis became more marked, and on the following day he was attacked with pleurisy in the right side. May 1st, well-marked pneumonia of the right side; respiration rapid; sputa rusty and frothy. Death resulted from pneumonia on May 4th. A careful dissection was made, and the lungs, larynx, and heart removed together. The larynx was pale. The epiglottis, with the edges and upper portion of the glottis, was swollen and œdematous, almost entirely closing the passage. There was a small irregular opening near the vocal cord of the left side, through which an abscess had evidently discharged. It had previously burrowed down to some extent in the cellular tissue, outside of the larynx, and had evidently been the cause of the sudden and urgent dyspnœa. There was well-marked hepatization of the lower lobe of the right lung. There was one pint of sero-purulent effusion, and numerous recent adhesions between the parietal and viscera pleura. The pathological specimen is No. 2513, Section I, A. M. M., and was contributed, with a history of the case, by Assistant Surgeon William F. Norris, U. S. A.

Case.—Private William H. Schlosser, Co. F, 140th Indiana Volunteers, aged 43 years, was admitted to Douglas Hospital, Washington, February 3d, 1865, with slight bronchitis, which improved up to February 12th, when he was attacked with sore throat and inflammation of the glands of the neck. The symptoms were not severe until the 17th, when great dyspnœa suddenly set in. The œdematous epiglottis, which was seen and felt, was immediately scarified, with some relief, which, however, was only temporary, and in the afternoon the operation of laryngotomy was decided upon, which was performed by Assistant

Surgeon William F. Norris, U. S. A. The patient died at the close of the operation from apnœa. At the necropsy the chink of the glottis was found almost closed by œdema of the tissues surrounding it. The epiglottis was also œdematous. The bronchial tubes were much injected down to their minute subdivisions. There was a small patch of pneumonic consolidation in the lower part of the left lung. The other organs were healthy.

CASE.—Private William Carpenter, Co. B, 1st Wisconsin Heavy Artillery, aged 20 years, was admitted to Harvey Hospital, Madison, Wisconsin, October 10th, 1864, with an abscess near the larynx. On December 25th, Surgeon H. Culbertson, U. S. V., performed tracheotomy for suffocation from œdema of the glottis. The patient had nearly ceased to breathe when the trachea was reached, and it was necessary to enter the trachea before the bleeding had stopped. Blood flowed into the trachea, and respiration and action of the heart ceased. A catheter was introduced, and artificial respiration established. A ligature was passed beneath the isthmus of the thyroid gland on each side to prevent further hæmorrhage, and a tube introduced. He died on December 25th, 1864, from syncope, induced by old heart clots. At the necropsy, an old abscess was found upon the right side of the larynx, which had destroyed the substance of the right thyroid cartilage, and lay beneath the mucous membrane and the cellular investment of the larynx, and extended down the trachea two inches from the cricoid cartilage. The rima glottidis was nearly closed, and would only admit a knitting-needle. The mucous membrane of the trachea was in a state of inflammation, and, opposite the abscess, thickened and indurated in bronchi and bronchioli. The lungs were healthy. Heart generally hypertrophied. The walls were attenuated, and in the right ventricle an old fibrinous deposit obstructed the circulation at the mouth of the pulmonary artery. The latter vessel was empty. The left ventricle was distended with dark grumous blood. The walls of the right ventricle and auricle presented fatty degeneration.

CASE.—Private James Simonds, Co. A, 3d New Hampshire Volunteers, aged 39 years, was admitted to the National Hospital, Baltimore, February 2d, 1865, with pneumonia in its first stage, extending over nearly the entire surface of the left lung. The respiratory murmur was finely crepitant on admission. Crepitation became more crude on the evening of February 6th. Symptoms of laryngeal inflammation set in, succeeded by those of œdema of the glottis, which continued until the 7th, when the patient was apparently dying. Respiration was excessively labored and ineffective. A blue color pervaded the surface. The pupils were dilated and the extremities cold. The operation of laryngotomy was performed by straight incision between the thyroid and cricoid cartilages. As soon as the operation was performed, all breathing by the glottis ceased except a little valvular cough. The opening was maintained at first by one, and afterwards by two gutta-percha tubes. Warmth returned to the extremities, and a faint color appeared in the face. Death resulted in twelve hours after the operation from pneumonic prostration.

Some operators would have reckoned the next case as a success, the patient having survived for sixteen days, and died of pneumonitis twelve days after the aperture in the larynx had been closed:

CASE.—Private J. J. Bryant, Co. E, 1st Texas Cavalry, aged 51 years, was admitted to the Marine Hospital, New Orleans, January 5th, 1865, suffering from œdema of the glottis. The patient became weak and emaciated. On the 25th, the larynx and adjoining parts were greatly swollen. Acting Assistant Surgeon R. W. W. Carroll performed laryngotomy. Immediate relief was afforded by the operation. The œdema gradually subsided, and on the fourth day the tube was removed and the aperture closed, but inflammation of the lungs supervening, death resulted on February 10th, 1865.

There were three operations for diphtheria, a successful instance of laryngotomy, and two of tracheotomy that terminated unfavorably:

CASE.—Private S. G. Inlay, Co. K, 180th Ohio Infantry, aged 30 years, was admitted to the 3d division hospital, Alexandria, Virginia, February 21st, 1865, with diphtheria. On March 5th, he was nearly asphyxiated. Assistant Surgeon W. G. Elliott, U. S. V., performed laryngotomy. Simple dressings were applied. He recovered, and was discharged from service June 14th, 1865.

CASE.—Sergeant James W. Sutherland, Co. D, 1st Maine Volunteers, aged 24 years, received a gunshot wound of the right thigh, at Cedar Creek, Virginia, October 19th, 1864, which fractured the femur just below the trochanter major. He was treated in the field, and, on October 24th, sent to Jarvis Hospital, Baltimore. The fracture was an exceedingly obstinate one, owing to the exterior injury caused by the ball. He became greatly emaciated and broken down, but after several months the fracture united by the use of Smith's anterior splint, a large amount of provisional callus being deposited. From this time he did well, and improved rapidly under the use of tonics, stimulants, and good diet; but there were several sinuses which communicated externally, and were still discharging a considerable amount of pus. On the morning of May 24th, 1865, he complained of some soreness of the throat, but symptoms of diphtheria were not specially marked, there being no traces of membrane whatever. About 10 o'clock P. M., the same day, the nurse was awakened by the groans and efforts of the patient to breathe. When medical attendance, which was close at hand, reached him, he was breathing stertorously; his tonsils were so much swollen as to nearly close the glottis and fauces, and the posterior nares were covered with diphtheritic membrane. Measures were at once resorted to for his relief, but without effect. About 12 o'clock P M., an operation was deemed necessary, and tracheotomy was performed by Acting Assistant Surgeon F. P. Foster, which seemed to give relief for a time; but he soon relapsed and gradually grew worse, until death, which occurred about 4 o'clock A. M., May 25th, 1865. At the necropsy the tonsils were found greatly enlarged, and the larynx and posterior nares covered with diphtheritic membrane, which extended a considerable distance down the trachea.

CASE.—Private Clement Dennison, Co. E, 32d Maine Volunteers, aged 17 years, was admitted to the hospital at Fort Wood, New York Harbor, October 29th, 1864, suffering from inflammation of the tonsils, with diphtheria. The constitutional condition of the patient was bad. On November 1st, Acting Assistant Surgeon Frederick D. Sturges performed tracheotomy, with but little loss of blood The neck being short and much swollen, the operation was quite difficult. Death resulted, November 2d, 1864, from exhaustion.

There were two successful operations for simple laryngitis:

CASE.—Private Martin Bowen, Co. K, 149th Pennsylvania Volunteers, aged 31 years, was admitted to Lincoln Hospital, Washington, October 24th, 1863, with pneumonia of the lower lobe of both lungs. On November 24th, asphyxia set in. Ether was administered, and Acting Assistant Surgeon W. F. Peck performed tracheotomy. One small vessel was ligated. About half an ounce of blood was lost. Tonics, stimulants, and nutritious diet were given. He gradually improved, and recovered, with the exception that he still had to wear the tube. He was transferred, on August 12th, to the hospital at Whitehall, Pennsylvania, and discharged from service June 26th, 1865.

CASE.—Private Alfred Newcomer, Co. H, 7th Michigan Volunteers, was admitted to Bellevue Hospital, New York City, suffering from laryngitis, contracted, by exposure, while convalescent from typho-malarial fever. Tracheotomy was performed. A few hours after the operation the pulse was 160, small and very weak; great irritation of the larynx, causing almost constant coughing. Stimulants and small quantities of beef tea were given. He soon commenced to improve, and in two weeks was able to sit up, and in four was walking about. He could breathe quite free through the tube, but it was found that it could not be removed. Discharged from service about the middle of October, 1862. Examiner J. A. Brown reported, March 9th, 1865, that respiration is entirely performed through the cannula. Disability three-fourths and increasing.

There were three cases in which the operation was practiced for threatened asphyxia from tonsillitis or abscess of the tonsil. One resulted successfully:

CASE—Private Taylor Misinger, Co. H, 130th Indiana Volunteers, aged 17 years, was admitted to Hospital No. 1, Nashville, Tennessee, April 3d, 1864, suffering from tonsillitis. On May 1st, 1864, spasm of the glottis set in. The patient became asphyxiated. Assistant Surgeon Robert McNeilly, 19th Ohio Volunteers, performed the operation of tracheotomy, dividing the second and third rings, and inserting a tube. Respiration was established in thirty seconds after the operation. The tube remained twelve hours. On June 25th, 1864, the wound had healed entirely, and the patient was returned to duty.

CASE.—Private Elias E. Terry, Co. M, 2d New Jersey Cavalry, was accidentally wounded at Memphis, Tennessee, April 2d, 1864, by a carbine ball, which fractured the second toe of the right foot. He was admitted on the same day to Adams Hospital, Memphis, where chloroform was administered, and the toe amputated by lateral flap method. Soon after the operation he was attacked with chills, which yielded to quinine. On April 17th, measles supervened, followed by intense tonsillitis and extreme dyspnœa. On April 21st, Surgeon J. G. Keenon, U. S. V., performed laryngotomy. He died seven hours after the operation from asyhyxia. The necropsy showed extensive inflammation of the larynx, bronchi, and trachea. The lungs were much engorged.

CASE.—Private Nelson Young, 2d Battery, 1st Maine Mounted Artillery, aged 23 years, received a slight gunshot wound, at Antietam, Maryland, September 17th, 1862. On October 16th, he was admitted to the hospital at Frederick, complaining of a sore throat. On the 29th there was slight swelling of the right tonsil, which became extended. Inflammation set in on the next day. Astringents were ordered. During the night of the 30th a large abscess burst, and he spat up pus. At 9.30 P. M., October 31st, Acting Assistant Surgeon Redfern Davies was suddenly called to attend him, and found his pulse feeble and too rapid to be counted. Respiration was excessively labored and quick, and had been so for one-half hour. The veins of the head and neck were turgid. On pulling out the tongue by the artery forceps respiration was relieved. The tongue was black, partly from the tincture of muriate of iron, and his lips were dark. As the symptoms grew more urgent, the skin and the crico-thyroid ligament were divided at one incision. The hæmorrhage was slight, and the respiration immediately relieved. A little froth issued from the opening; he also breathed by the opening. The pulse immediately fell to about ninety-six, and the lips became almost natural. Finding that he respired easily through both mouth and opening, no tube was used. At 11 P. M. Dr. Davies was again summoned. The symptoms had reappeared. A triangular portion of the crico-thyroid cartilage was removed. No hæmorrhage followed. Respiration gradually declined, and at 11.30 P. M. he died. At the autopsy, twelve hours after death, the tonsils were found to be ulcerated, the right one especially, which was deeply ulcerated and still contained some pus. The uvula was thickened by effusion of lymph, and ulcerated on the right side. The epiglottis was erect, hard, and thickened by effusion of lymph underneath the mucous membrane. The arytæno-epiglottidean folds were much thickened, especially on the right side, which was considerably above the level of the left. The opening of the sacculus laryngis was entirely closed by the effusion above. Several small patches of false membrane by deposit of lymph were found above the vocal cords, especially on the left side; none below. The mucous membrane of the trachea and bronchia was deeply congested, but without ulceration, effusion, or deposit.

Excision of Tonsils for Disease.—Only two instances of this operation are recorded:

CASE—Private John K. Orlup, Co. D, 1st Illinois Light Artillery, aged 20 years, was admitted to Desmarres Hospital, Chicago, Illinois, October 11th, 1864. The right tonsil was considerably enlarged, and greatly obstructed the isthmus of the fauces. By May 12th, 1865, the tonsil had become hypertrophied and dense. Surgeon J. S. Hildreth, U. S. V., excised the right tonsil. His breathing became easier and general health greatly improved. He was discharged from service May 25th, 1865.

CASE.—Private Milton Scott, 24th Ohio Battery, aged 21 years, was admitted to Desmarres Hospital, Chicago, Illinois, October 28th, 1864, suffering from double otirrhœa. The tonsils became largely hypertrophied, closing at least three-fourths of the isthmus of the fauces. On January 28th, 1865, Surgeon J. S. Hildreth, U. S. V., excised both tonsils. Little inflammation followed. The wound healed rapidly. He was discharged from service June 26th, 1865. His hearing and general health were considerably improved.

LIGATIONS.—Twenty-nine cases of ligations for gunshot wounds of the neck were reported. A few will be cited in detail. The first six are of the primary carotid:

CASE.—Corporal *J. W. Robinson*, Co. C., 27th Georgia Regiment, aged 21 years, was wounded June 19th, 1864. A musket ball entered the muscles of the neck, just external to the spine, on the left side, passed downward, wounded the internal

carotid artery, and probably some branch of the occipital. He was conveyed to the Washington Street Hospital, Petersburg, Virginia, where the left common carotid artery was ligated in the superior triangle. On July 2d, the hæmorrhage recurred. July 3d, the ligature came away; the artery was re-ligated below the omo-hyoid, but the hæmorrhage still continued, though in diminished quantity, until July 5th, when death occurred.

Case.—Lieutenant William Fisher, Co. A, 99th Pennsylvania Volunteers, was wounded at Petersburg, Virginia, October 7th, 1864, by a conoidal ball, which entered two inches behind the angle of the left inferior maxilla, and lodged beneath the integument, near one of the cervical vertebræ, severing the facial and carotid arteries. He was conveyed to the hospital of the 3d division, Second Corps. He was much exhausted from loss of blood. Beef essence and brandy were administered. On October 9th, Surgeon William B. Reynolds, 2d U. S. Sharpshooters, ligated the left common carotid artery below the omo-hyoid muscle. Death resulted in twenty-six hours after the operation.

Case.—Lieutenant Charles Debolt, Co. D, 82d Ohio Volunteers, received a gunshot wound of the neck at Bull Pasture Mountain, Virginia, May 8th, 1862. The missile entered the triangular space formed by the sterno-cleido-mastoid muscle and the larynx, and passed backward and downward along the spine. Surgeon J. Y. Cantwell, 82d Ohio Volunteers, who reports the case, says: "There was but little hæmorrhage at the time the wound was received, and considering the locality and extent of the injury, he seemed to be doing remarkably well up to the 15th day. On the night following that day he had an attack of secondary hæmorrhage that very nearly proved fatal before I could reach his bed. I found him in a state of syncope and pulseless at the wrist. The orifice was immediately filled with lint, saturated with a solution of persulphate of iron, the common carotid artery being compressed at the same time. This completely arrested the bleeding. After watching him until daylight, at which time his pulse and consciousness had returned, I carefully cut down and exposed the common carotid artery, when I ascertained that the hæmorrhage was caused by a slough in the coats of the external carotid, so near the bifurcation that it could not be ligated; hence the ligature was applied upon the common carotid." The case progressed well to all appearances for six weeks, but suddenly terminated fatally. At the necropsy, a collection of matter was discovered in the locality of the right kidney.

Case.—Private Hollis Hutchins, Co. I, 25th Ohio, aged 25 years, was wounded at Pocotaligo, South Carolina, December 9th, 1864, by a conoidal ball, which entered the chin, fractured the inferior maxillary bone, and emerged at the back of the neck. He was transferred, on December 11th, per steamer Cosmopolitan, to Beaufort, South Carolina, entering the 1st division hospital on the 15th. On the 18th, a violent hæmorrhage occurred from the mouth, which was supposed to proceed from the lingual artery, and left him very much exhausted and almost pulseless. Acting Assistant Surgeon S. Hendrickson ligated the common carotid artery just above the omo-hyoid. The patient rallied after the operation, and continued to gain strength until December 27th, when hæmorrhage occurred from the trunk of the carotid and the internal jugular vein. He died on the same day. The necropsy showed an organized clot below the ligature; above the ligation no clot had formed, and the coat of the internal jugular vein had sloughed away.

Here we have another of the numerous examples of recurrent hæmorrhage from the distal end of the divided or ligated artery. There was an occlusive coagulum on the cardial side of the ligature,—none on the cranial side. In treating of hæmorrhage from wounds of the extremities, there will be ample opportunity of demonstrating the soundness of the views of Guthrie on hæmorrhage, and of furnishing examples of the happy results following the teachings of that great surgeon regarding the management of bleeding arteries:

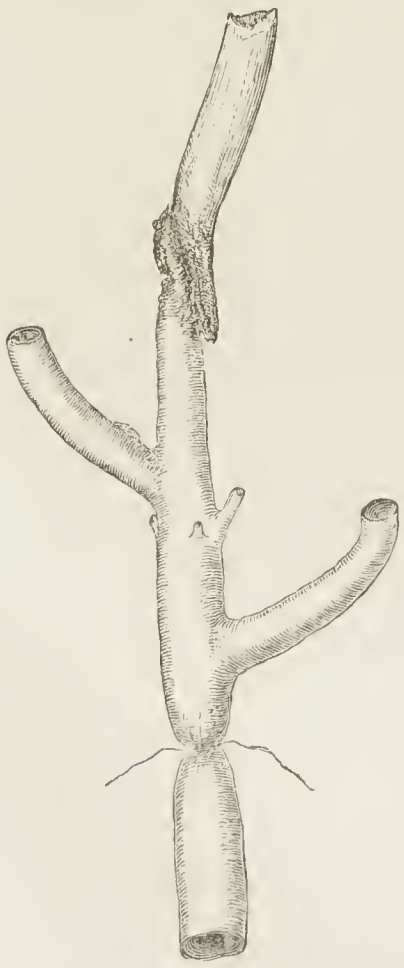

Fig. 186.—Gunshot wound of external carotid. *Spec.* 3969, Sect. I, A. M. M.

Case.—Private Daniel Shockey, Co. I, 101st Indiana Volunteers, aged 22 years, was wounded at Chickamauga, Georgia, September 20th, 1863, by a round musket ball, which entered the face about an inch from the corner of the mouth, passed downward and backward across the upper part of the neck, badly fractured the lower jaw in its passage, and was extracted near the transverse process of the third cervical vertebra. He was taken prisoner and treated in a Confederate hospital. On September 25th, hæmorrhage occurred to the amount of a quart, recurring on the 30th. Three other hæmorrhages, of October 6th, 9th, and 10th, respectively, so reduced the strength of the patient that the common carotid was ligated. The ligature separated October 29th. He was paroled in April, 1864, and sent to Baltimore, entering Jarvis Hospital on the 18th. He recovered, and was transferred to Camp Parole, Annapolis, May 11th, 1864, and mustered out June 24th, 1865, as corporal.

Case.—Private G. W. B———, Co. G, 42d Virginia, aged 25 years, was admitted to hospital at Frederick, Maryland, for a gunshot wound of the neck and face received at Gettysburg, July 3d, 1863. There was secondary hæmorrhage to the extent of twelve ounces, on July 9th, from the external carotid artery. The common carotid was ligated three-quarters of an inch below the bifurcation, on July 10th. Hæmorrhage did not recur. The patient died July 13th, 1863. A wet preparation of the ligated artery was contributed to the Army Medical Museum, with the history, by Assistant Surgeon R. F. Weir, U. S. A., and is No. 3969 of the Surgical Section. It is represented in the adjoining wood-cut.

Tabular Statement of Fifteen Ligations of the Common Carotid Artery for Gunshot Injuries of the Neck.

No.	NAME AND MIL. DES.	INJURY.	LIGATION.	DATE OF WOUND.	DATE OF HÆMORR'AGE.	DATE OF OPERATION.	RESULT.		REMARKS.
							RECOVERY.	DEATH.	
1	Beane, J. Private, 11th Pennsylvania Volunteers.	Gunshot wound of neck and left shoulder; common carotid and jugular vein injured.	Lower portion of left common carotid.	May 10, 1864	May 15, 1864, recurred May 21, 1864.	May 15, 1864	.....	May 21, 1864	Operator, Surgeon Edwin Bentley, U. S. V.
2	Burns, R., Private, 10th Massachusetts Volunteers.	Gunshot wound of mouth and neck.	Common carotid and lingual arteries.	May 30, 1862	.....	June 18, 1862	.....	June 19, 1862	
3	Clink, M., Private, 95th Pennsylvania Volunteers.	Gunshot wound of head; ball entered neck on right side, behind, passing through antrim, and out beside nose.	Common carotid.....	May 3, 1863	.....	May 16, 1863	.....	May 20, 1863	
4	*Creecy, B.* Private, 42d Virginia Regiment.	Ball passed through larynx, at upper margin of thyroid cartilage, impinging slightly upon thyro-hyoid membrane.	Left common carotid, at point of election; right common carotid, at point of election.	May 3, 1863	May 12, 1863, recurred May 15 & 20, 1863.	May 12, 1863 May 15, 1863	.....	May 20, 1863	Operator, Surgeon Russell Murdock, P. A. C. S.
5	Dainaby, E., Private, 1st Maine Cavalry.	Missile entered below jaw, passed down and out of back of neck, wounding carotid artery.	Carotid	April 12, 1865	May 5, 1865	.....	.....	May 15, 1865	
6	*Felix, W.*, Private, 9th Virginia Regiment.	Gunshot fracture of right inferior maxilla; ball severed lingual artery and œsophagus, and lodged against seventh cervical vertebra, wounding vertebral artery.	Left common carotid, below omo-hyoid.	Aug. 25, 1864	Sept. 3, 1864, recurred Sept. 4, 1864.	Sept. 3, 1864	.....	Sept. 4, 1864	Operator, Assistant Surgeon R. F. Weir, U. S. A.
7	*Gardner, J. B.*. Private, 5th Louisiana Regiment.	Missile entered one inch anterior to left ear, passed inward, downward, and backward and lodged.	Left common carotid, a few lines from its origin.	.....	Feb. 17, 20, 21, 22, 1865.	Feb. 22, 1865	.....	Feb. 22, 1865	Operator, Assistant Surgeon W. F. Richardson, P. A. C. S.
8	Hughes, D. C., Private 11th Virginia Volunteers.	Gunshot wound of neck	Left common carotid; right common carotid.	.....	.....	May 17, 1862	.....	May 17, 1862	
9	Harrington, M., Private, 21st New York Volunteers.	Musket ball entered at outer margin of the left malar bone, and emerged beneath left mastoid process.	Left common carotid, at point opposite cricoid cartilage; right common carotid.	July 24, 1864	Aug. 9, 1864, recurred Aug. 14, 1864.	Aug. 10, 1864 Aug. 14, 1864	.....	Aug. 19, 1864	Surgeon J. B. Lewis, U. S. V.
10	Messenger, P. B., Sergeant, 111th Pennsylvania Vols.	Gunshot wound of lower jaw and throat.	Right common carotid	Nov. 14, 1863	Dec. 3, 1863	Dec. 3, 1863	.....	Dec. 8, 1863	Operator, Assistant Surgeon Henry Pearce, 150th N. Y. V. A. M. M. *Spec.* No. 2018.
11	McKenney, E., Private, 6th Pennsylvania Cavalry.	Buckshot entered left side of neck, just over anterior edge of sterno-mastoid muscle, a little below body of thyroid notch, and passed out below and to the left of the occipital protuberance.	Left common carotid.....	Jan. 1, 1863	Jan. 1, 1863, recurred April 6, 1863.	Feb. 26, 1863	.....	April 6, 1863	Operator, Assistant Surgeon R. F. Weir, U. S. A.
12	Moore, J. G., Corporal, 110th Pennsylvania Volunteers.	Gunshot wound left side of head.	Left common carotid.....	Feb. 6, 1865	Feb. 15, 1865, recurred Feb. 23, 24, 1865.	Feb. 15, 1865, re-ligated Feb. 21, 1865.	.....	Feb. 25, 1865	Operator, Assistant Surgeon John Vansant, U. S. A.
13	Rollin, J. N., Private, 1st N. Carolina Volunteers.	Conoidal ball entered back of neck and passed out of left cheek.	Common carotid.....	Oct. 19, 1864	.....	Nov. 9, 1864	.....	Nov. 9, 1864	Operator, Acting Assistant Surgeon G. G. Brewer.
14	*Smith, W. W.*, Confederate ..	Gunshot wound of head and neck.	Common carotid.....	May 5, 1864	May 12, daily until May 21, 1864.	May 21, 1864	.....	May 22, 1864	
15	Kelley, R., Private, 6th Louisiana Volunteers.	Gunshot wound of neck; division of external carotid artery.	Common carotid.....	July 3, 1863	.....	July 13, 1863	.....	.....	

Ligation of Subclavian.—But a single instance of deligation of the subclavian for gunshot wound of the neck is recorded. It was an unsuccessful case, in which a single ligature was placed, outside of the scalenus, on the left side, for secondary bleeding:

GRAVES, H., Private, 5th Pennsylvania Cavalry. Gunshot wound of external edge of sterno-cleido-mastoid muscle, left side, about two inches above clavicle. Ball lodged. Wounded October 6th, 1864. Hæmorrhage occurred December 14th, 1864. Left subclavian artery ligated in third portion by Assistant Surgeon W. E. Day, 117th New York Volunteers, December 16th. Died December 18th, 1864.

A number of examples of ligations of minor trunks were also reported. When both ends were tied recovery ensued, and the other cases resulted unfortunately:

DUTTON, A. H., Colonel, 21st Connecticut Volunteers. Gunshot wound of right side of neck. Ball fractured the lower maxilla and passed through the larynx, May 29th, 1864. Hæmorrages occurred May 31st and June 2d. Facial artery ligated at entrance of wound, June 2d. Died June 4th, 1864.

BARRICK, T., Corporal, 44th New York Volunteers. Gunshot wound left side of neck, July 2d, 1863; ball lodged. Ball extracted. Hæmorrhage occurred July 21st. Suprascapular artery and two or three branches ligated on the same day. Recovered August 15th, 1863.

Adzer, L. C., Private, Co. K, 9th Louisiana Regiment, aged 20 years, was wounded at Monocacy Junction, July 9th, 1864, by a conoidal ball, which penetrated the neck, severing the occipital artery. He was admitted on the same day to the hospital at Frederick, Maryland. On July 19th, secondary hæmorrhage to the amount of sixteen ounces occurred, and on the next day Surgeon C. H. Todd, C. S. A., ligated the occipital artery in the wound; both ends were secured. He recovered, and was transferred to West's Buildings Hospital, Baltimore, August 5th. Transferred to Fort McHenry for exchange, November 19th, 1864.

HOLLIDAY, D., Sergeant, 26th Pennsylvania Volunteers. Flesh wound of left side of neck, July 2d, 1863. Hæmorrhage occurred July 25th, and recurred on the same day. Branch of occipital artery ligated in wound, July 25th; both ends tied. Recovered May 3d, 1864.

POTTER, J. H., Private, 15th Massachusetts Volunteers. Gunshot wound of left posterior triangle of neck, June 18th, 1864. Hæmorrhage, July 13th, 1864. One end of superficial cervical artery ligated, in wound, on the same day. Recovered September 23d, 1864.

A successful instance was reported of ligation of the internal jugular vein, a subject that has been exhaustively discussed since the conclusion of the war, by Dr. Samuel W. Gross,* late Staff-surgeon of Volunteers:

CASE.—Private William Seymour, Co. G, 57th New York Volunteers, aged 19 years, was wounded at the Wilderness, May 5th, 1864, by a conoidal ball, which entered just below the lobulus of the left ear, and passing obliquely downward and forward, emerged one inch above the sterno-clavicular articulation of the right side, external to the sterno-mastoid muscle; the missile then struck the subclavian region at the external end of the middle third of the clavicle, and glanced off along the arm without touching it. He fell unconscious on the reception of the injury; fifteen minutes after which, he walked to the rear assisted by a comrade. He had considerable hæmorrhage, which ceased spontaneously. He was admitted to the hospital of the 3d division, First Corps. Cold water dressings were applied to the wounds, and beef tea administered, which partly escaped through the wound of exit, giving evidence of injury of the pharynx. He was transferred to hospital via Fredericksburg and Belle Plain; the mode of conveyance being an army wagon, the jolting of which caused a slight hæmorrhage, which he expectorated *per orem;* he also stated having expectorated a piece of meat one inch in length. He was, on May 11th, admitted to Douglas Hospital, Washington. Cold water dressings were applied to the wounds, and the patient was fed through gum-elastic bougies, and injections *per anum* of beef tea for four days, at the end of which he was able to swallow milk with ease. He gradually improved until May 19th, when he had a secondary hæmorrhage from the mouth, amounting to seven ounces of blood. On May 20th, he bled one ounce; 26th, four ounces; and on the 27th, a venous hæmorrhage occurred, which was arrested by compression. On the 29th, hæmorrhage recurred, amounting to two ounces of blood; and again on the 30th, to the amount of four ounces; after which it was thought advisable to ligate the carotid artery. Assistant Surgeon William Thomson, U. S. A., made an incision for the artery, which was searched for a long while, but found to be obliterated. From that time no hæmorrhage occurred, and the patient rapidly recovered. On June 10th, the wound of entrance was entirely closed, and that of exit granulating finely. He had lost the power of the right arm, and for a long time had complete aphonia. The wound had an excrescence not unlike cauliflower, which was daily decreasing in size. He was transferred to Turner's Lane Hospital, Philadelphia, on September 11th. On his admission, the wounds had closed; sensation and motion feeble throughout the right arm; neck had only one-fourth range of movement; the sense of touch was lost from the chin to the external angle of the right eye, and lessened on upper neck; analgesia was more or less complete in these parts; loss of gustation of the right side of the tongue, pain and sense of temperature limited by median line. Very far back there seemed to be considerable sensation, motion seemed good on the right side, and the left side was paralyzed as to motion entirely. Deglutition was imperfect; the voice nearly perfect; appetite and digestion good. On October 10th, the face had recovered sensation; taste not perfect;

*GROSS, *Amer. Jour. of Med. Sci.*, 1867, Vol. LIII, pp. 17, 305.

tact and pain still absent. On the 20th, there was some feeling in the tongue, but no motion on the left side. He was returned to duty on December 9th, 1864. On May 2d, 1866, Examining Surgeon E. Winslow reports that Seymour's wounds had healed externally; but the trachea was constantly discharging pus, brought up by coughing, and was hoarse, and his right arm weak.

The fatal case, in which ligatures were placed above and below a puncture of the internal jugular, made by the operator in extracting a ball (*ante* p. 397), and the two fatal cases of gunshot wounds of the jugular treated by cold applications, compression, and position (pp. 411, 412), will not have escaped the reader's attention.

I fully agree with Dr. Gross, that this subject has received less attention from surgeons than it merits, and should enlarge upon it here, were it not preferable, in order to avoid repetitions, to defer its consideration to a separate chapter on *Venous and Arterial Hœmorrhages.*

Grouping the ligations of the large vessels of the neck, performed on account of gunshot wounds of the face or of the neck, we have a total of seventy-five ligations of the common carotid, with a mortality of .78. The exhibit is yet more deplorable than that of the preliminary report in *Circular* 6, S. G. O., 1865, which gave, for forty-nine cases, a fatality of .75, and will furnish M. Léon Lefort (*Gaz. Hebdom. de Méd. et de Chir.*, Paris, 1867) an additional argument against the performance of this operation for traumatic causes, unless the injury involve the main trunk itself, and a ligature can be placed above and below the point of injury. Nowhere else, not even in wounds of the fore-arm or legs in which the brachial or femoral may have been tied, does the operation of Anel appear to greater disadvantage. Tying the common trunk for injuries of the smaller vessels of the head or neck is an operation based on a fallacious interpretation of the anatomical and physiological relations of the region. Nothing that is not corrobora-

tive of Guthrie's admirable suggestions is found in the preceding cases. If the indolent or timid surgeon, who, to control bleeding from minor branches of the carotid, prefers to stuff the wound with styptics, or to perform the easy operation of tying the common trunk, rather than to seek in the difficult anatomy of the maxillary and thyroid regions, to place double ligatures at the bleeding point, he may temporize, or may associate his name with the necrology of ligations; but if his patient recover, it will generally be found to be under circumstances in which the surgeon's operative intervention was uncalled for.*

The subject of gunshot wounds of the *nerves* of the neck, briefly illustrated on p. 408, *et seq.*, by a series of concise abstracts, has been throroughly and ably discussed by Acting

* On page 397 (*ante*) have been cited a few works on ligations. Consult further: JONES, J. F. D., *A Treatise on the Process employed by Nature in suppressing the Hœmorrhage from Divided and Punctured Arteries and on the Use of the Ligature*, London, 1810; PILZ, C., *Zur Ligatur der Arteria Carotis Communis nebst einer Statistik dieser Operation*, in *Archiv für Klinische Chirurgie*, von Dr. B. VON LANGENBECK, Berlin, 1868, IX Band, S. I.; MANEC, *On the Ligature of Arteries*, Halifax, 1832, and *Traité théorique et pratique de la Ligature des Artères*, Paris, 1834; *Year Book of Medicine and Surgery*, London, 1862, pp. 80, 240; KEITH, *Successful Ligation of the Internal Carotid, Monthly Jour. of Med. Sci.*, Edinburgh, May, 1851, p. 435, probably an unique case; BOUCHARD, *De la Pathogénie des hémorrhagies*, Paris, 1869; CHASSAGNY, *Nouveaux moyens hémostatiques*, Paris, 1868; MOTT, A. B., *Hœmorrhage from Wounds, and the best means of arresting*, New York, 1863; SANSON, *Des hémorrhagies traumatiques*, Paris, 1836; VELPEAU, *Recherches sur la cessation spontanée des hémorrhagies traumatiques primitives*, Paris, 1830; LISTER, *Observations on Ligatures of Arteries on the antiseptic System*, Edinburgh, 1869. I believe that Hennen's statement, that he was "not acquainted with any monograph upon wounds of the neck," might be reiterated at the present day, unless the artiele of Mr. Arthur E. Durham, in Holmes's *System*, Vol. II, p. 436, be regarded as an exception. Consult PARÉ, par MALGAIGNE, Paris, 1840, T. II, p. 81; RUST, J. N., *Einige Beobachtungen ü. d. Wunden der Luft- und Speiseröhre*, etc., Wien, 1814; ALLAN BURNS, *Surg. Anat. of the Head and Neck*, 1811, 1st ed., 1824, 2d ed.; SIMONNEAU, *Essai sur les solutions de continuité du pharynx et de l'œsophage*, 1808, *Thèse de Paris*, No. 150; G. BOULIN, *Dissertation sur les plaies de l'œsophage*, 1828, *Thèse de Paris*, No. 146; SABATIER, *Des plaies du cou*, in *Med. Opér.* 1832, T. II, p. 70; JOBERT, *Plaies d'armes à feu*, 1833, p. 155; LAUGIER, *Dictionnaire en trente* (*Blessures du cou*), 1835, T. IX, p. 162; LARREY, *Sur les Plaies de l'œsophage*, in *Clin. Chirurg.*, 1829, T. II, p. 154; DUPUYTREN, *Blessures du cou* in *Leçons oral. de cl. chirurg.*, 2me éd., T. VI, p. 271, 1839; LEGOUEST, *op. cit.* p. 406, 1863; FORESTUS, P., *Observationum et Curationum Medicinalium ac Chirurgicarum Opera Omnia*, Francofurti, 1634, I, p. 423; TRIGEN, *Observationum Medico-Chirurgicarum Fasciculus*, Lugduni, 1743; GUATTANI, *Essai sur l'Œsophagotomie, Mém. de l'Acad. de Chir.*, Paris, 1819, T. III, p. 343; VERDIER, *Sur une Plaie de la Gorge, avec des Remarques intéressantes sur ce sujet*, Ibid., p. 153; LARREY, *Mém. de Chir. Mil.*, Paris, 1817. T. IV, p. 249; GROSS, *op. cit., Phil.*, 1866, p. 382; GIBB, *Diseases of the Throat and Windpipe, as reflected by the Laryngoscope*, London, 1864; WISEMAN, *Several Chirurgical Treatises*, London, 1676, p. 363; DIEFFENBACH, J. F., *Die Operative Chirurgie*, B. II, S. 321, Leipzig, 1848; BELL, J., *A Manual of the Operations of Surgery*, London, 1866, p. 178; HUNT, WM., in *Amer. Jour. of Med. Sci*, April, 1866, p. 378.

Assistant Surgeons S. Weir Mitchell, George R. Moorehouse, and William W. Keen, who were assigned to the wards in the United States Army Hospital, Christian Street, Philadelphia, with a view to this special enquiry. How well they acquitted themselves of their task is shown by their publications.* It is better to refer the reader to those careful studies than to attempt an elaboration of the disconnected clinical notes recorded in this Office. Two cases, however, specially communicated, of relief of paralysis by the removal of balls, must not be omitted:

Case.—Sergeant *F. C*———, Co. F, 60th Alabama Regiment, aged 24 years, was wounded at Petersburg, March 31st, 1865, by a conoidal ball, which entered the face one inch and a half above the left angle of the mouth, knocked out two bicuspides and half of the first molar of the upper jaw; chipped the second molar of the lower jaw, transfixed the tongue, which it split about two inches to the apex, and lodged in the supra-hyoid space. Profuse hæmorrhage occurred at the time of the injury, and continued more or less for several days. The wound was probed in search of the ball, but it could not be reached; the vessels were, however, secured, and the hæmorrhage arrested. The tongue became very much swollen, in which condition it remained for about a week, during which period no solid food was taken. On April 7th, the patient was admitted into the Confederate hospital at Danville, where another unsuccessful search was made for the ball. He was furloughed on April 11th, and sent to Montgomery, Alabama. The wound healed rapidly, and he was not disturbed until the middle of July, when, after much uneasiness during deglutition, his tongue became paralyzed and continued so until about August 10th, when power and motion returned to the organ. On September 20th, violent pain set in, and continued until October 1st, during which time an abscess formed on the anterior surface of the right side of the neck, on a level with the cornua of the hyoid bone; this was opened, discharging pus very freely. His condition was relieved until the middle of December, when the pain in the neck returned. Upon examination, it was discovered that the depressor muscles of the neck were in a partially paralyzed condition. The pain continued until February 1st, when it ceased, but soon returned with increased violence. On February 14th, the patient reported to Dr. R. Fraser Michel, at Montgomery, who detected a foreign body in the lower part of the neck, near the trachea, which proved to be the ball. This was removed through an incision along the anterior margin of the sterno-mastoid at a point where the omo-hyoid crosses the cervical region. The base of the ball rested beneath the deep-seated cervical fascia, where its layers unite upon the anterior border of the sterno-mastoid to be prolonged onwards to the middle line of the neck. After the removal of the ball, a considerable quantity of pus was discharged. The wound healed in a few days, and the patient was entirely relieved. The ball was very ragged, twelve points of extreme asperity being detected upon its external surface. Three fossæ, evidently depressions made by the three teeth from the upper jaw, were discernible, and, near the base, quite an excavation, in which was lodged the chipped portion of the middle molar of the lower jaw, so imbedded that it could not be removed without injuring the specimen. The point of interest in the case is the passage of a ball through the entire length of the neck, amid important blood-vessels and nerves, without material injury to the part. First, pressing upon the hypo-glossal nerve and producing paralysis of the tongue; and, secondly, touching the descendens noni and producing partial paralysis of the depressor muscles of the larynx.

Case.—Private George T. Cottrell, Co. G, 1st United States Sharp-shooters, aged 21 years, was wounded, while in the act of firing, at the battle of Chancellorsville, Virginia, May 2d, 1863, by a conoidal ball entering about one-half an inch above left clavicle, and about an inch from its sternal extremity, and passing behind the trachea, lodged just under the right clavicle where the subclavian emerges. He was conveyed to Washington, D. C., and admitted into St. Aloysius Hospital, May 7th, 1863. There was but little blood lost. A numb pain ensued, which lasted six months, referred particularly to the elbow-joint and fingers, the fingers remaining semi-flexed three months. He was unable to speak aloud for two weeks, and nourishment could only be taken in liquid form. The limb was carried at right angles, and, by the middle of July, the wound had perfectly healed and never re-opened. At this date, the joint, which had become firmly fixed at right angles, from inaction, was straightened while the patient was under the influence of chloroform, and frequent flexion and extension subsequently fully restored the use of the joint. He was returned to duty in 2d battalion, Veteran Reserve Corps, October 31st, 1863, and discharged from the service on September 14th, 1864. The hand and fingers continued to be very sensitive to cold and heat, and, at times, were very painful. One morning, in the fall of 1865, he found that the power of supporting the head was lost to such an extent, that he was unable to rise from his bed; and clonic muscular contraction, drawing the head to the right shoulder, lasted four days, but did not recur. Late in December, 1869, the pain at the point of lodgement began to increase; and on January 31st, 1870, Prof. N. S. Lincoln, M. D., having placed the patient under the influence of chloroform, cut down and removed the ball, which was found thrust in between the subclavian and a branch of the brachial plexus, the missile resting on the artery just where it emerges from beneath the clavicle, and the nerve drawn tightly across the ball in front. On pushing aside this nerve from the missile, vigorous contraction of the limb was produced. The wound closed readily by granulation. The limb is now equal to its fellow in size and strength, and, with the exception of a very slight sensitiveness of the fingers to cold and heat, which is improving, the patient is entirely relieved. He is unwilling to present the ball to the Museum. Mr. Cottrell is a clerk in the Treasury Department. In May, 1872, there was a dull pain from the shoulder, along the course of the nerve of the arm, during cold and damp weather. Case reported by Dr. H. W. Sawtelle of the Treasury Department.

Other cases germane to this subject will be found in the next chapter.

* *Circular No.* 6, Surgeon General's Office, March 10th, 1864, *On Reflex Paralysis.* See also *Gunshot Wounds and Other Injuries of Nerves*, 12 mo., pp. 164, Philadelphia, 1864; Mitchell, *Injuries of Nerves and their Consequences*, small 8 vo. pp. 377, Phila., Lippincott & Co., 1872.

CHAPTER IV.

WOUNDS AND INJURIES OF THE SPINE.

Cases belonging to this category are commonly discussed by systematic writers immediately after lesions involving the head and encephalon. But inasmuch as, in the majority of cases, the fractures and other injuries of the vertebral column are complicated by injuries of the neck, chest, or abdomen, it seems best to devote to them a separate chapter. The total number of cases reported is about six hundred. They will be referred to under three sections:

Section I.

INCISED WOUNDS, CONTUSIONS, AND MISCELLANEOUS INJURIES.

Seventy-seven cases of this class are on record.

Incised Wounds.—Only two incised wounds of the spine are recorded; one with a fatal termination, the other resulting in recovery.

Case.—Private William P. Cook, Co. D, 6th Tennessee Cavalry, aged 25 years, was admitted to Overton Hospital, Memphis, Tennessee, November 25th, 1864, with an incised wound of the spine inflicted on November 10th, 1864, with a knife. Simple dressings were applied to the wound. He was returned to duty on December 15th, 1864.

Case.—Private George S——, Co. B, 15th New York Engineers, was admitted to Armory Square Hospital, Washington, on April 22d, 1863, having been stabbed with a knife in the back, at Falmouth, Virginia, on the 20th. He was completely paraplegic; the urine had to be drawn off by the catheter, and nothing but croton oil, in three-drop doses, succeeded in producing a passage three days after admission, two days after which, involuntary defecation and micturition set in. Sphacelus on all the projecting parts of the lower part of the body soon followed, proceeding rapidly until it nearly reached the spine of the sacrum. On May 10th, chills came on and recurred daily: death ensued on May 26th from exhaustion. The fourth, fifth, and a portion of the sixth dorsal vertebræ, sawn longitudinally to exhibit the blade of the knife, which appears to have been broken off at the time of injury and remains fixed in the specimen, are numbered 1160 of the Surgical Section, and were contributed to the Army Medical Museum by Assistant Surgeon C. C. Byrne, U. S. A. See adjoining wood-cut (Fig. 188).

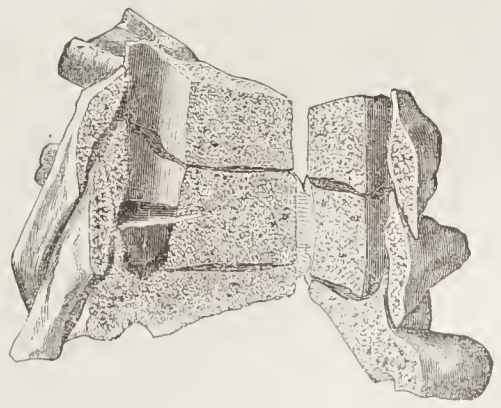

Fig. 188.—Fourth, fifth, and a portion of the sixth dorsal vertebræ, sawn asunder to exhibit a dirk which traversed the spinal canal. *Spec.* 1160, Sect. I, A. M. M.

CONTUSIONS AND MISCELLANEOUS INJURIES.—Seventy-nine cases are reported; caused principally by falling from horses, by blows from muskets or other blunt weapons, and by falling of trees. A few proved fatal from fracture or luxation or from peritonitis, and, in one instance, from the complication of small-pox:

CASE.—Corporal John B———, Co. C, 10th New York Volunteers, of good constitution and physical condition, while felling trees at Hatcher's Run, Virginia, March 11th, 1863, was struck across the dorsal and lumbar vertebræ by a falling limb, which had been severed by a shell. Being knocked senseless, he remained in this condition for an hour or more, until awakened by the motion of the ambulance that conveyed him to regimental headquarters. On returning to consciousness, he was unable to move the lower portion of his body. Arriving at Patrick's Station, he was cupped, and mustard applied to the calves of the legs and to the spinal region. He complained of pain in the lower portion of the body. He was blistered, and the blisters dressed with lint. He was sent to City Point, and finally, to Washington, where he entered Finley Hospital on the 19th. When admitted, he was in a semi-comatose condition; complete paraplegia; sensation perfect. There was some febrile action, and very severe diarrhœa. He passed his urine and fœces involuntarily; appetite very good; pulse full and bounding; emaciation slight. The temperature of the right leg was slightly higher than that of the left, but both were very cold; skin moist. The blistered parts on each leg were suppurating slightly. The parts in the region of the sacrum were in a gangrenous condition. Opiates were given at night and chlorides used to cleanse the gangrenous wounds over the sacrum. Under the administration of astringents the diarrhœa ceased by the 25th. The patient, however, continued to sink, and died on March 29th, 1865. At the autopsy, the first lumbar vertebra was found transversely fractured entirely through its body at its upper third, with each pedicle broken and the left transverse and spinous processes encroaching upon the cord, which was lacerated at the lumbar and dorsal junction. The membranes were torn entirely across, except a few fibres anteriorly and posteriorly, and were congested above and below the seat of injury. Clots of diffused blood were found near the fracture. The lower portion of the cord, severely lacerated, was drawn up into a bundle at the seat of injury, entirely deprived of the membranes. The pathological specimens are Nos. 149 and 150, Section I, A. M. M., and were contributed, with a history of the case, by Acting Assistant Surgeon W. Dusenbury.

CASE.—Private Joshua C———, Co. H, 4th Ohio Volunteers, aged 23 years, received an injury of the spine, December 21st, 1863, from a tree falling across him, in camp. On January 27th, 1864, he was admitted to the 3d division hospital, Alexandria, Virginia, with entire paralysis of the lower extremities, both as to sensation and motion. He did not complain of any great amount of pain. His appetite was good. There was no movement of the bowels, except as the effect of a cathartic, and his urine had to be drawn regularly, otherwise it passed involuntarily from him upon the bladder becoming partly full. The muscles of the thigh and legs twitched involuntarily. Blisters were ordered to the spine in the neighborhood of the second dorsal vertebra, which was dislocated. February 10th: Counter irritation has been thoroughly tried, with no good result. Bed-sores formed on each hip, although an astringent wash had been used and pressure prevented as far as possible, and it was feared that the vitality of the parts was so low as to prevent their healing. Patient sank gradually; his appetite became poor; bed-sores worse, and the discharge from them very abundant and offensive. Death resulted on April 28th, 1864. At the autopsy, forty-eight hours after death, the viscera was found apparently healthy; there was pressure upon the cord at the point of dislocation of the vertebral column and effusion within the membranes. The pathological specimen is No. 2255, Section I, A. M. M., and shows the fifth, sixth, seventh, eighth, and ninth dorsal vertebræ, completely fractured through the eighth and displaced forward. The bones are partially retained in their abnormal relation by callus deposited in the neighborhood. The fracture passes transversely through the body and embraces the processes also. It was contributed, with a history of the case, by Surgeon Edwin Bentley, U. S. V.

CASE.—Captain Thorwald J———, Commissary of Subsistence, U. S. V., was injured at Larkinsville, Alabama, on the evening of December 31st, 1863, by the falling upon him of the front of a building. He was taken out in a few minutes. Upon examination, bruises were found on the head in the frontal and occipital regions, and on other parts of the body. No bones appeared broken or displaced. There was complete paralysis of the arms and legs, and extreme sensitiveness of the front of the neck and upper part of the thorax. He was not, at any time, insensible. Respiration was performed only by the diaphragm, causing, throughout the case, great suffering from dyspnœa. The symptoms indicated dislocation or fracture of the cervical vertebræ below the phrenic nerve, and above the brachial plexus. No displacement of the spinous processes could be detected, and the patient was able to raise his head and move it from side to side. The treatment adopted was, of course, only palliative. The bladder was emptied by means of the catheter. His condition continued with very little change, except greater or less difficulty of breathing, until death, which occurred on the evening of January 3d, 1864, about seventy-six hours after the accident, from asphyxia. A partial examination, next morning, revealed a fracture of the fourth cervical vertebra. The left lamina was in two pieces and depressed upon the spinal cord. The pathological specimen is No. 2080, Section I, A. M. M, and was contributed, with a history of the case, by Surgeon J. S. Prout, 26th Missouri Volunteers.

CASE.—Private John A. T———, Co. I, 1st New York Engineers, aged 18 years, while bathing at Folly Island, South Carolina, July 27th, 1864, dived from the beach in two feet of water, striking upon the top of his head against the hard sandy bottom. There was immediate loss of sensation and power of motion below the shoulders and in the upper extremities, except over and in the flexor muscles of the forearms, and, apparently, the deltoid, though the extension of the arm at the shoulder was rather feeble and indeterminate, and was probably performed by the long or scapular head of the biceps. Respiration was diaphragmatic; pulse but little accelerated; consciousness complete. There was some, though not excessive, pain in the lower cervical region. He was at once conveyed to the hospital for detachments and civilians at Folly Island, and laid on his back, on a mattress. An anodyne was given during the night Eighteen hours after the injury, a fever set in, followed by some

delirium; an enema was given, which soon procured a copious alvine discharge. From the fifty-fourth to the sixtieth hour, a similar fever prevailed, which was allayed by the application of ice to the head, and mustard to the feet and thighs, with wet cups along the spine. After the first operation, there was some incontinence of feces and of flatus, but not of urine, the sphincter of the bladder retaining its power to the last, although of course, the urine was drawn off by the catheter. Asphyxia did not become prominent until the sixty-second hour, but steadily increased until death, which occurred on July 30th, 1864, sixty-eight hours after the reception of the injury. At the autopsy, two hours after death, the body of the sixth cervical vertebra was found vertically fractured, the posterior edges of the partially separated halves pressing upon the anterior surface of the cord, opposite the origins of the seventh and eighth cervical nerves, and the third and fourth of the brachial plexus. The crural arch of the sixth cervical vertebra was also broken down, and there was dislocation of the spinous processes of the fourth, fifth, and sixth cervical vertebræ and sufficient fracture of their arches to injure the cord, including most of the roots of the sixth cervical, but not at all those of the fifth nerve. At these points of direct injury, the substance of the cord was inflamed and disorganized into a red pulp. The inflammation and disorganization had also extended upward along the gray commissures and the posterior horns of the gray substance almost to the medulla-oblongata. The origins of the phrenic nerve having been untouched by the original injury, the diaphragm was able to continue its function of abdominal respiration, until, perhaps, the advancing inflammation invaded its origins. The pathological specimen is No. 3159, Section I, A. M. M., and was contributed, with a history of the case, by Assistant Surgeon Burt G. Wilder, 55th Massachusetts Volunteers.

Ahern, J. A., Sergeant, Co. E, 31st Ohio Volunteers, aged 23 years. Concussion of spine. Atlanta, August 29th, 1864. Treated in Hospital No. 8, Nashville, Tennessee. Returned to duty on January 24th, 1865.

Alexander, George W., Captain, 1st Michigan Cavalry. Injury of spine by fall from horse. Gettysburg, July 3d, 1863. Discharged from service.

Allen, Asa, Private, Co. D, 60th New York Volunteers, aged 25 years. Contusion of spine by fall. Treated in Hospital No. 14, Nashville. Liniments. Transferred to Veteran Reserve Corps, October 18th, 1864.

Bean, Josiah, Private, Co. I, 31st Maine Volunteers. Injury of spine. Spottsylvania, Virginia, May 12th, 1864. Treated in Lincoln Hospital, Washington. Returned to duty on May 24th, 1865.

Benham, Thomas, Private, Co. A, 150th New York Volunteers, aged 35 years. Spinal injury. Treated in hospital at Columbus, Ohio. Returned to duty on March 20th, 1865.

Boren, J. H., Private, Co. D, 91st Indiana Volunteers. Contusion of spine. Treated in Hospital No. 19, Nashville. Mustered out on June 26th, 1865.

Bowen, William H., Private, Co. C, 32d Iowa Volunteers, aged 38 years. Contusion of spine, lumbar portion, by fall from horse. Treated in Washington Hospital, Memphis. Cupping and blistering. Returned to duty on July 23d, 1864.

Breese, John, Private, Co. H, 5th Illinois Cavalry, aged 17 years. Concussion of spine by being thrown from his horse. Treated in Adams Hospital, Memphis. Died on March 15th, 1865, from chronic peritonitis.

Breese, F. F., Private, Co. B, 83d Pennsylvania Volunteers. Injury of spine by fall of horse. Anodynes and counter irritants. Discharged from service on February 23d, 1865.

Bright, Samuel, Private, Co. H, 124th Indiana Volunteers, aged 18 years. Spinal concussion from fall. Treated in Cumberland Hospital and Hospital No. 8, Nashville. Simple dressings. Returned to duty.

Brooks, W. J., Sergeant, Co. E, 77th Illinois Volunteers, aged 26 years. Spinal injury by fall from wagon. Treated in hospital at Quiney, Illinois. Died on January 8th, 1864, from small-pox.

Bryant, Charles F., Corporal, Co. K, 33d Massachusetts Volunteers. Injury of spine. Treated in Mason Hospital, Boston. Simple dressings. Returned to duty on June 3d, 1864.

Buck, Bowman H., Sergeant, Co. F, 3d New Jersey Volunteers, aged 35 years. Contusion of spine from limb of tree. Spottsylvania, Virginia, May 10th, 1864. Treated in Baltimore and Wilmington hospitals. Rest. Returned to duty on August 2d, 1864.

Buick, Anthony, Bugler, Co. I, 12th Kentucky Cavalry. aged 34 years. Injury of spine by fall from a horse, May, 1862. Treated in hospital at Louisville, Kentucky. Tonics and stimulants. Returned to duty on August 10th, 1863.

Burch, Bernard, Private, Co. I, 4th Michigan Cavalry, aged 20 years. Spinal injury by fall from horse at Mammoth Cave, October, 1862. Treated in hospital at Quincy, Illinois. Counter-irritation. Returned to duty on December 21st, 1863.

Carpenter, James W., Private, Co. E, 1st Massachusetts Cavalry. Injury of spine. Treated at Mason Hospital, Boston. Simple dressings. Returned to duty on May 9th, 1864.

Catherman, Lewis, Private, Co. E, 7th Pennsylvania Cavalry, aged 33 years. Injury of spine by fall from horse. Treated in hospital at Louisville. Catharties. Returned to duty on July 11th, 1863.

Clarkson, George A., Private, Co. A, 5th Michigan Cavalry. Contusion of spine by fall from horse. Treated in hospital at Point Lookout, Maryland, and Washington and Baltimore. Liniments and counter-irritants. Returned to duty on October 28th, 1863.

Clift, Amos, 1st Lieutenant, Co. F, 1st Connecticut Cavalry. Injury of spine by fall from horse. Discharged from service on August 2d, 1865.

Cook, J. C., Private, Co. G, 8th Indiana Cavalry, aged 37 years. Concussion of spine. Treated in Hospital No. 8, Nashville, Tennessee. Returned to duty, September 24th, 1864.

COOPER, ALBERT, Sergeant Major, 1st Michigan Artillery, aged 35 years. Injury of spine. Treated in Hospital No. 8, Nashville. Returned to duty on August 8th, 1864.

COREY, JOSEPH R., Private, Co. L, 1st Rhode Island Cavalry, aged 56 years. Spinal injury. Treated at Satterlee Hospital, Philadelphia. Tonics. Discharged from service on June 6th, 1863.

CRUPPER, JOHN, Private, Co. G, 64th Ohio Volunteers, aged 19 years. Contusion over spine, by limb of a tree. Westville, December 16th, 1864. Treated in Hospital No. 14, Nashville. Liniments. Returned to duty on May 17th, 1865.

DODD, JAMES L, Private, Co. A, 34th Illinois. Contusion of spine. Treated in Hospital No. 8, Nashville. Discharged from service on July 12th, 1865.

FARNSWORTH, H. M., Private, Co. C, 2d Massachusetts Cavalry, aged 42 years. Injury of spine. Treated at Turner's Lane Hospital, Philadelphia. Discharged from service on January 25th, 1865.

FOLEY, HUGH, Private, 36th Company, 2d Battalion, Veteran Reserve Corps. Injury of spine and breast by fall from bridge. Treated in Harewood, Hospital, Washington. Stimulants and tonics. Discharged from service on December 9th, 1863.

FREHSE, LOUIS, Private, Co. B, 37th Ohio Volunteers, aged 26 years. Injury to spinal column. Treated in Crittenden Hospital, Louisville. Simple dressings. Returned to duty on August 1st, 1864.

FUDGE, PHILIP M., Private, Co. A, 74th Ohio Volunteers, aged 21 years. Concussion of spine. Treated in Hospital No. 8, Nashville. Discharged from service.

GAY, ROBERT, Private, Co. I, 112th Illinois Volunteers, aged 39 years. Spinal concussion from fall. Treated in Hospital No. 8, Nashville. Returned to duty on January 26th, 1865.

GLASSHOOK, GEORGE N., Private, Co. D, 12th United States Infantry, aged 27 years. Spinal injury. Treated in Harewood Hospital, Washington. Returned to duty on June 21st, 1863.

GREISINGER, ALEXANDER, Private, Co. K, 1st Ohio Artillery, aged 29 years. Contusion of spine. Treated in Cumberland Hospital, Nashville, Tennessee. Rest and liniment. Returned to duty.

HALER, WILLIAM C , Private, 19th Indiana Battery, aged 34 years. Contusion of spine. Treated in Hospital No. 8, Nashville, Tennessee. Returned to duty on November 15th, 1864.

HERSEY, JOSIAH E., Private, Co. D, 17th Illinois Volunteers. Injury of spine. Shiloh, April 6th, 1862. Treated in hospital at Quincy, Illinois. Blisters. Discharged from service on May 26th, 1864.

HERTON, HENRY R., Corporal, Co. B, 1st Michigan Sharp-shooters, aged 31 years. Injury of spine by falling tree. Treated in Mount Pleasant Hospital, Washington. Returned to duty on July 2d, 1864.

HERVEY, WILLIAM, Private, Co G, 98th Illinois Volunteers. Injury of spine and chest. Treated in Hospital No. 9, Louisville, Kentucky. Liniments and cathartics. Transferred to Veteran Reserve Corps on July 20th, 1864.

HILLABIDDLE, DANIEL W., Musician, Co. G, 125th Ohio Volunteers, aged 46 years. Contusion of spine. Treated in Hospital No. 8, Nashville. Discharged from service.

HIRAM, BENJAMIN, Private, Co. B, 78th Ohio Volunteers, aged 40 years. Contusion over spine. Treated in Hospital No. 14, Nashville. Liniments. Returned to duty.

HOY, JOSEPH, Private, Co. D, 98th Illinois Volunteers, aged 31 years. Contusion over spine. Treated in Cumberland Hospital, Nashville. Simple dressings. Discharged from service on June 27th, 1865.

HIMLETT, GEORGE, Lieutenant, Co. M, 2d New Jersey Cavalry, aged 23 years. Concussion of spine, March 30th, 1864. Treated in Officers' Hospital, Memphis, Tennessee. Returned to duty on April 18th, 1864.

HUTSMAN, CHARLES, Corporal, 1st Iowa Battery, aged 25 years. Spinal concussion from blow. Treated in Adams Hospital, Memphis. Discharged from service.

IVES, RICHARD F., Sergeant, Co. G, 7th Illinois Cavalry, aged 26 years. Spinal concussion. Treated in Hospital No. 8, Nashville. Returned to duty on December 21st, 1864.

JACKSON, JAMES F., Corporal, Co. D, 36th Wisconsin Volunteers. Injury to spine. Treated in Lincoln Hospital, Washington. Returned to duty on December 28th, 1864.

KENNEDY, JAMES T., Private, Co. C, 25th New York Cavalry, aged 36 years. Spinal injury by fall from horse at Harper's Ferry, August, 1864. Treated in hospital at Philadelphia. Returned to duty on February 25th, 1865.

KING, ISAAC M., Private, Co. D, 3d New Jersey Volunteers. Spinal injury by blow from a musket. Chancellorsville, Virginia, May 3d, 1863. Treated in hospital at Philadelphia. Blisters. Discharged from service on February 2d, 1864.

LEARD, SAMUEL F., Corporal, Co. B, 129th Indiana. Injury of spine by fall. Treated in hospital at Madison, Indiana. Liniments. Returned to duty on November 21st, 1864.

LEONARD, EDWARD L., Private, Co., D, 24th Wisconsin Volunteers. Injury of spine by fall from bunk. Milwaukee, Wisconsin, September 1st, 1862. Treated in hospital at Quincy, Illinois. Counter-irritation. Discharged from service on February 17th, 1864.

NOWBIT, LORA, Private, Co. I, 4th Maine Volunteers, aged 29 years. Injury of middle of spinal column, June 9th, 1864. Treated in Lincoln Hospital, Washington. Deserted on December 5th, 1864.

McCLURE, THOMAS, Private, Co. H, 6th Pennsylvania Reserves, aged 30 years. Injury of spine by fall. Treated at Satterlee Hospital, Philadelphia. Liniments. Returned to duty on January 11th, 1864.

McMASTERS, THOMAS S., Private, 5th Wiseonsin Battery, aged 28 years. Coneussion of spine. Treated in Hospital No. 8, Nashville. Returned to duty on November 25th, 1864.

McPHERSON, C. C., Assistant Surgeon, 73d Illinois Volunteers, aged 27 years. Contusion of spine from railroad aceident. Treated in Hospital No. 1, Chattanooga, and Officers' Hospital, Nashville. Simple dressings. Leave of absenee on November 27th, 1864.

MARTIN, SAMUEL, Private, Co. C, 98th Ohio Volunteers, aged 23 years. Injury of spine by fall. Treated in Hospital No. 8, Nashville. Returned to duty.

MAY, ERASTUS J., Private, Co. C, 177th Ohio Volunteers, aged 29 years. Injury of spine from fall. Treated in hospital at Madison, Indiana. Liniments. Deserted on April 6th, 1865.

MITCHELL, JOSEPH, Private, Co. D, 8th Kansas Volunteers, aged 21 years. Injury of spine by fall from bridge. Treated in hospital at Louisville, Kentueky. Tonics and stimulants. Discharged from serviee on August 5th, 1863.

MOREN, GEORGE W., Corporal, Co. C, 10th Indiana Cavalry, aged 43 years. Coneussion of spine by railroad aeeident on May 6th, 1864. Treated in Hospital No. 2, Vicksburg. Simple dressings. Discharged from service.

PARISH, MORTIMER, Private, Co. K, 1st Michigan Engineers, aged 24 years. Contusion of spine by fall. Treated in Hospital No. 14, Nashville, and Crittenden Hospital, Louisville. Diseharged from service on May 9th, 1865.

PARKER, WILLIAM W., Corporal, 176th Co., 2d Battalion, Veteran Reserve Corps. Injury of spine. Treated in Mason Hospital, Boston, Massachusetts. Simple dressings. Returned to duty on June 3d, 1864.

PAYNE, M. C , Private, Co. A, 6th Illinois Cavalry, aged 23 years. Injury to spine by fall of horse. Treated in hospital at Quincy, Illinois. Rest. Discharged from serviee on November 24th, 1864.

REY, GEORGE, Lieutenant, Co. C, 100th Illinois Volunteers. Contused wound of the spine by limb of a tree. Stone River, Tennessee, December 30th, 1862. Treated in Hospitals No. 2, Nashville, and No. 14, Louisville. Returned to duty on January 18th, 1863.

RICHARDSON, THOMAS C., Private, Co. D, 4th Illinois Cavalry, aged 30 years. Concussion of spine. Grierson's Raid, December, 1864. Treated in Hospital No. 2, Vicksburg. Simple dressings. Returned to duty.

RYNO, EDWARD, Private, Co. L, 4th Miehigan Cavalry, aged 22 years. Injury of spine by fall from horse. Treated in Cumberland Hospital, Nashville. Simple dressings. Discharged from service.

SABINES, JAMES, Sergeant, Co. K, 49th Ohio Volunteers. Injury of spine by falling from a wagon. Treated in general hospital at Madison, Indiana, by eounter-irritation. Diseharged from serviee on July 7th, 1864; case eonsidered hopeless.

SAUNDERS, JOHN B., Private, Co. K, 143d New York Volunteers, aged 47 years. Injury of spine at lumbar region by fall. Treated in Satterlee, West Philadelphia. Diseharged from serviee.

SHEPHERD, WILLIAM, Private, Co. B, 6th New Jersey Volunteers, aged 23 years. Injury of spine in lumbar region. Treated in Mount Pleasant Hospital, Washington. Returned to duty on July 9th, 1864.

SHIRLEY, MILTON D., Sergeant, Co E, 10th New Jersey Volunteers, aged 20 years, reeeived an injury of the spine by a blow from a gun at Cold Harbor, June 3d, 1864. He was treated in Campbell Hospital, Washington. Returned to duty on August 24th, 1864.

SHOEMAKER, FREDERICK, Private, Co. B, 37th Ohio Volunteers, aged 28 years. Contusion of spinal column. Treated in Crittenden Hospital, Louisville. Simple dressings. Returned to duty on August 1st, 1864.

SLATER, FRANK, Private, Co. E, 6th New York Artillery, aged 21 years. Contusion of right side and spine by fall of horse, May 30th, 1864. Treated in Mount Pleasant Hospital, Washington. Discharged from service on June 1st, 1865.

SNELLING, H. G., Private, Co. F, 9th Massachusetts Volunteers. Injury of spine. Treated at Fairfax Seminary, Virginia, and South Street Hospital, Philadelphia. Simple dressings. Transferred to Veteran Reserve Corps, June 6th, 1864.

SNYDER, COLUMBUS, Private, Co. D, 7th Ohio Cavalry. Injury of spine. Treated in hospital at Camp Dennison, Ohio. Discharged from service on June 5th, 1863.

TAYLOR, EDWARD H., Private, Co. A, 37th Massachusetts Volunteers, aged 38 years. Sprain of spinal column at Cold Harbor on June 3d, 1864. Treated in Lincoln Hospital, Washington. Discharged from serviee on June 17th, 1865.

TILSE, WILLIAM, Private, Co. B, 37th Ohio Volunteers, aged 26 years. Contusion of spinal column. Treated in Crittenden Hospital, Louisville. Simple dressings. Returned to duty on October 4th, 1864.

TRAVELSTEAN, D. W., Private, Co. C, 100th Illinois Volunteers, aged 38 years. Injury of spine by a barrel falling on him at Lumsville, Kentucky, October, 1862. Treated in hospital at Quincy, Illinois. Counter-irritants, shower baths, and tonics. Diseharged from serviee on February 17th, 1864.

WARINER, JAMES A., Private, Co. D, 16th Pennsylvania Cavalry. Injury of spine by fall from horse. Treated in hospital at Philadelphia. Cold applications. Returned to duty.

WHITE, W. J., Private, Co. E, 46th Illinois Volunteers. Injury of spine and rheumatism, by falling into a ditch Treated in hospital at Quiney, Illinois. Diseharged from service on June 15th, 1865.

WHITEHOUSE, BENJAMIN, Private, Co. C, 1st Ohio Artillery, aged 16 years. Contusion of spine and lumbar region. Treated in Asylum Hospital, Knoxville, Tennessee. Returned to duty on May 30th, 1865.

WOOD, HAVER D., Private, Co. F, 2d New York Heavy Artillery, aged 25 years. Contusion of spine, June 12th, 1864. Treated in Lincoln Hospital, Washington. Deserted on July 7th, 1864.

Section II.

GUNSHOT WOUNDS.

Cases of gunshot injury of the vertebræ were commonly fatal; yet a few examples were recorded in which the transverse or spinous apophyses only were injured, in which more or less complete recovery ensued, and fewer still in which the patients survived for a protracted interval, after fractures of the bodies of vertebræ. The following abstracts are not grouped very accurately, but are generally placed according to region and result:

Fractures of the Cervical Vertebræ.—In the five following cases, the patients recovered; but with stiff necks or palsied arms:

Case.—Private John Mason, Co. D, 17th Vermont Volunteers, aged 43 years, was wounded at Spottsylvania, Virginia, May 12th, 1864, by a conoidal ball, which entered behind and below the left ear and emerged at the base of the neck two inches to the right of the spine, injuring the spinous processes of the vertebræ. He was treated in field hospital until May 23d, when he was admitted to Mount Pleasant Hospital, Washington. On May 27th, he was transferred to the hospital at Chester, Pennsylvania. There was partial paralysis of the left arm. On June 18th, he was transferred to the Sloan Hospital, Montpelier, Vermont, and, on September 11th, to Baxter Hospital, Burlington, whence he was transferred to the Veteran Reserve Corps on April 27th, 1865. Pension Examiner H. H. Atwater reports, July, 1866, that the left arm is numb and weak, and that the pensioner suffers from stiffness and pain in the upper part of the spine.

Case.—Lieutenant *T. L. Whitaker*, Co. D, 24th North Carolina Regiment, aged 31 years, was wounded near Richmond, Virginia, May 16th, 1864, by a round ball, which entered at the angle of the inferior maxilla, fractured the transverse processes of the fourth and fifth cervical vertebræ and lodged. He was conveyed to Richmond and admitted to Chimborazo Hospital. There was paralysis of the left arm and partial paralysis of the left leg and right arm. Cold applications were made. He was furloughed on June 7th, 1864, having partially recovered the use of his right arm and left leg.

Case.—Private John Monday, Co. E, 47th Pennsylvania Volunteers, aged 19 years, was wounded at Pocotaligo, South Carolina, by a bullet, which entered the left side of the neck two inches from the spine, passed transversely across the neck through the spinous process of the sixth cervical vertebra and emerged at a point corresponding to point of entrance. He was conveyed to Beaufort and admitted, on October 24th, to Division No. 1 Hospital. The patient was unable to bend his neck, but moved the spine as a whole. A poultice and rest were ordered and half diet. On November 10th, some pieces of bone having come away, and suppuration having nearly ceased, the poultices were discontinued and cerate dressings used. He was discharged from hospital on November 16th, at which time the wounds had nearly healed, but the neck remained stiff.

Case.—Private Charles G. Cleland, Co G, 7th Wisconsin Volunteers, aged 20 years, was wounded at Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal ball, which entered the right upper lip at the second incisor, destroyed all the teeth save the last molar on the same side of the upper jaw, passed below the soft palate and penetrated the posterior pharynx and the body of the third cervical vertebra. He was treated in field hospital until July 10th, when he was sent to Satterlee Hospital, and, on August 7th, transferred to Christian Street Hospital, Philadelphia. Here the presence of the ball was determined by a Nelaton probe and extracted. There was paralysis in all four limbs, from which, however, he rapidly recovered and, for a time, did duty as hospital attendant. He was transferred to Turner's Lane Hospital on March 14th, 1864. Acting Assistant Surgeon W. W. Keen, jr., on duty at that hospital, states that "nearly the entire body of the third cervical vertebra has come away, including the anterior half of the transverse process and the vertebral foramen. No injury to the vertebral artery has been disclosed. What supports his head, anteriorly, I can't conceive. On May 3d, 1864, he was transferred to Washington to be assigned to a company in the Veteran Reserve Corps. The only remnant of his paralysis is some of sensation over a surface, say three by four inches, at the back of right neck. Some bone still occasionally discharges." Examiner Joseph Gadd reports, April 1st, 1871, that the right side of the tongue is distorted, leaving his speech affected; that the right side of his throat is contracted, and that the right shoulder and arm are diminished in size and partially paralyzed. Disability three-fourths and permanent.

CASE.—Private Peter C. Miller, Co. K, 7th, Wisconsin Volunteers, aged 36 years, was wounded at the Wilderness, Virginia, May 5th, 1864, by a conoidal ball, which passed transversely beneath the trapezius muscle and emerged at its anterior margin, fracturing the spinous process of the seventh cervical vertebra. He was taken to the field hospital of the 4th division, Fifth Corps, where pieces of bone were removed and simple dressings applied. On May 11th, he was sent to Douglas Hospital, Washington; on May 18th, to Satterlee Hospital, Philadelphia, and, on July 9th, to Harvey Hospital, Madison, Wisconsin, whence he was discharged from service on December 17th, 1864. The motion of the cervical region was imperfect and painful.

The nine following abstracts relate fatal gunshot injuries of the cervical vertebræ:

CASE.—Private George A. A———, Co. C, 20th New York Volunteers, aged 40 years, was wounded at Gettysburg, July 2d, 1863, by a conoidal ball, which fractured the right lower jaw and the sixth and seventh cervical vertebræ. He was admitted into the Satterlee Hospital, Philadelphia, on July 9th, 1863. On July 14th, 1863, pyæmia developed. Quinine and iron, in large doses, were administered; stimulants and generous diet were given. The patient died on July 21st, 1863. The necropsy showed the right side of the lower jaw to be fractured and comminuted midway between the symphysis and angle, and the parts in the vicinity somewhat gangrenous. The connective tissue on the right of the pharynx and descending behind the œsophagus was blackened and gangrenous. The body of the sixth cervical vertebra was broken through, and a fragment was chipped from the seventh. The ball was not found; it was stated that the patient had ejected it from his mouth. The œsophagus, the trachea, and the bronchial mucous membranes were inflamed. The right lung was in a recent pneumonic condition, and filled with a multitude of small abscesses. The pericardium was distended with serum, but the heart and all the other organs appeared healthy. It was stated that the patient had difficulty of breathing, but had no paralysis; he walked about until a few days before his death, and had only complained of a slight uneasy feeling when turning his neck, the fracture of which was not suspected during life. The specimens are No. 1881, Sect. I, A. M. M., a wet preparation of the lower jaw, and No. 1867, Sect. I, A. M. M., the last four cervical and first dorsal vertebræ, and were contributed, with the history, by Acting Assistant Surgeon Joseph Leidy.

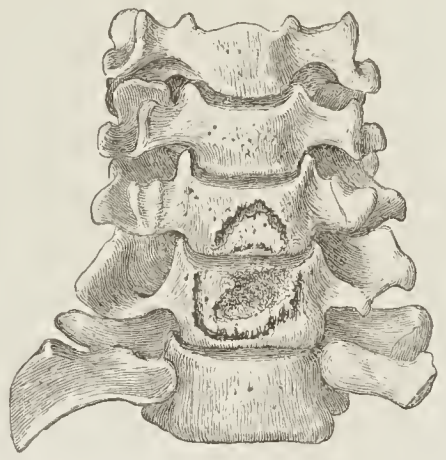

FIG. 189.—Caries of the last two cervical vertebræ following gunshot injury. *Spec.* 1867, Sect. I, A. M. M.

CASE.—Corporal Mark D———, Co. D, 11th United States Infantry, was wounded at sunrise, August 31st, 1864, while on picket duty near the Weldon Railroad, Virginia. He was soon afterward brought to the field hospital of the Fifth Corps, where, on examination, it was found that a musket ball had entered the right side of the neck, at the posterior border of the sterno-cleido-mastoid muscle near its middle, and passed inward, downward, and backward. Some swelling and discoloration existed upon the left side of the neck, at and above the clavicle, but the ball could not be felt. Paralysis of motion was complete in the extremities and sensation was lost in them except in the arms near the shoulders, where it still existed to a slight degree. Nearly the entire trunk was without sensation and its only motion was that of respiration, which was performed by the diaphragm. The bladder was paralyzed, and the urine drawn off with a catheter. The bowels were not under the control of the will. Deglutition and respiration were slightly obstructed by swelling of the tissues near the track of the bullet. The patient could whisper, but spoke aloud with difficulty. His pulse was at first nearly normal, but afterward became weak and frequent. The lividity of the countenance indicated a want of aëration of the blood. The shock from the receipt of the wound seemed to be slight and he retained his intellectual faculties until death, which took place at eleven o'clock P. M., September 1st. At the *post mortem* examination, the ball was found in the subscapular muscle in contact with the scapula of the left side. It had taken a direct course from its entrance, and passed diagonally through the bodies of the fifth and six, and fractured the laminæ and transverse processes of the sixth and seventh cervical vertebræ, slightly lacerating the spinal cord and forcing it to one side of the canal and compressing it seriously in its passage. The pathological specimen, consisting of portions of the last four cervical vertebræ, was contributed to the Army Medical Museum by Assistant Surgeon Edward Brooks, U. S. A., and is numbered 4157 of the Surgical Section.

CASE.—Lieutenant *George C*———, Co. K, 20th North Carolina Regiment, aged 24 years, was wounded at Monocacy Junction, Maryland, July 9th, 1864, by a conoidal ball, which entered the anterior part of the neck immediately to the left of the thyroid cartilage, passed through between the roots of the seventh and eighth cervical nerves, and emerged between the spinous processes of the seventh cervical and first dorsal vertebræ, a little to the left of the neck. He was taken to Frederick, and admitted on the next day to the 1st division hospital. Simple dressings were applied. By August 4th, the wounds of entrance and exit had entirely healed. Large bed-sores had formed on the back, arms, and legs. There was entire paralysis, with involuntary discharge of urine and feces and a profuse diarrhœa. He was placed upon a water-bed and tonics and stimulants, in connection with opiates and astringents, given internally, but the diarrhœa obstinately persisted, and the patient sank exhausted and died on August 12th, 1864. The autopsy revealed a slight effusion of blood between the membranes and cord on the right side and external to the membranes on the anterior part of the spinal cord. There was no direct injury to the cord. The pathological specimen, consisting of a wet preparation of the bodies and transverse processes of the last cervical and first two dorsal vertebræ, with the corresponding portion of the cord, were contributed to the Army Medical Museum by Assistant Surgeon R. F. Weir, U. S. A., and is numbered 3976 of the Surgical Section.

CASE.—Sergeant J. H. R———, Co. H, 11th Pennsylvania Reserves, was wounded at Fredericksburg, Virginia, December 13th, 1862. The ball entered near the inferior angle of the scapula, fracturing the anterior border, neck, and coracoid process; it then passed through the left clavicle, causing a fracture of the outer and middle thirds; then behind the scaleni muscles, carrying away the transverse processes of the third and fourth cervical vertebræ, laying bare the vertebral artery,

opening the sheath of the carotid, and finally lodged behind the symphysis of the inferior maxilla. He was conveyed to Washington, and, on December 16th, admitted to Carver Hospital. Death resulted on December 22d, 1862. The autopsy revealed great infiltration of blood in the cellular tissues of the neck and in the mediastinum. The pathological specimens, consisting of the fractured clavicle and scapula, with the third, fourth, and fifth cervical vertebræ, are numbered 640, 641, and 901, Surgical Section, Army Medical Museum, and were contributed, with a history of the case, by Surgeon O. A. Judson, U. S. V.

Case.—Private W. P———, jr., Co. F, 114th Pennsylvania Volunteers, was wounded at the battle of Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball, which entered about an inch below and back of the left mastoid process, passed inward and upward, and lodged. He was treated in the field hospital for several days, was then put on board of the steamer State of Maine, and conveyed to the 1st division hospital, Annapolis, Maryland. On June 2d, the wound was enlarged and the ball discovered, supposed to be sticking about the mastoid process, and an unsuccessful effort made to extract it. On June 3d, the wound was still further enlarged, and a few small pieces of lead removed with the bullet-forceps, the ball still remaining in the head. About an hour after the operation, the patient complained of a severe chill, from which he soon recovered upon the administration of brandy. June 5th, pulse 160. Nervous twitching of the upper lip. Urine difficult to pass and highly colored. On the morning of June 6th, he vomited a greenish fluid; an enema was administered, which produced a free evacuation of the bowels and the vomiting ceased, but he became delirious and weak, and failed rapidly until June 8th, when death supervened. At the autopsy, the ball was found lodged against the occipital and atlas, producing a fracture of the atlas and a fissure of the left portion of the occipital. It is supposed that the attempts made to extract the ball were unsuccessful on account of the contraction of the muscles of the neck. The pathological specimen is No. 1710, Section I, A. M. M., and was contributed, with the history, by Surgeon B. A. Vanderkieft, U. S. V.

Case.—Private Leverett E———, Co. A, 8th Connecticut Volunteers, aged 22 years, of small stature and feeble build, was wounded at Antietam, Maryland, September 17th, 1862, by a musket ball, which entered the open mouth about the middle of the left anterior pillar of the fauces and emerged at the back of the neck two inches from the spinous process of the second cervical vertebra, on its left side. He was treated in field hospital until the 22d, when he was admitted to the hospital at Frederick, Maryland. He stated that, upon the reception of the injury, he lost considerable blood, producing faintness for several hours. After admission, patient did well until October 31st, when arterial hæmorrhage occurred to the amount of a wine-glassful, recurring slightly two days after. On November 13th, after eating breakfast, his mouth was observed to turn inward; all facial expression on the left side was gone. In an hour, muttering delirium occurred. Death resulted on November 14th, 1862. The autopsy revealed that the internal artery was cut by the ball and closed by a strong coagulum. The remainder of the artery had disintegrated and had passed away in the discharge. The hæmorrhage was from small openings in the external carotid. The pathological specimen is numbered 778, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon Redfern Davies.

Case.—Private David A. C———, Co. D, 4th New York Heavy Artillery, aged 27 years, was wounded at Petersburg, Virginia, March 31st, 1865, by a conoidal ball, which entered on the left side of the neck and passed through the vertebræ, producing paralysis of the lower extremities and left arm and hand. He was taken to the field hospital of the 1st division, Second Corps, where simple dressings were applied to the wound, and he was sent, after several days, to Harewood Hospital, Washington. On admission, the condition of the injured parts appeared to be tolerably good, but the constitutional state of the patient was very low; he was entirely unable to move his limbs, and, at times, to retain his urine and feces. He remained in this condition, notwithstanding the free use of tonics, stimulants, and a supporting treatment throughout, and gradually sank and died on April 29th, 1865, from exhaustion. The pathological specimen is No. 4346, Section I, A. M. M., and was contributed, with a history of the case, by Surgeon R. B. Bontecou, U. S. V.

Case.—Private *E. W. F*———, Co. K, 1st Virginia Cavalry, received a gunshot wound of the neck at Suffolk, Virginia, April 13th, 1863. He was conveyed to Baltimore, where death resulted on May 11th, 1863. The pathological specimen, No. 1791, Section I, A. M. M., consists of several cervical vertebræ, showing the bodies of the third and fourth entirely carried away by gunshot and subsequent suppuration. The borders of the cavity are necrosed, and the membranes have ulcerated sufficiently to expose a large extent of the cord. The specimen illustrates how life may be preserved for a long time after extensive injury to the spinal cord. It was contributed by Surgeon B. Beust, U. S. V.

Case.—Sergeant George E———, Co. A, 2d Texas Cavalry, an unusually robust and healthy man, was, on June 4th, 1865, shot twice by a comrade. He was immediately taken to the hospital at Brownsville, Texas. One ball entered one-fourth of an inch below the frontal sinus, fractured the nasal bones and the internal angular processes of the os frontis, and passed downward and backward, but could not be found. The other ball entered about half an inch below the clavicle, passed to the opposite side of the body, and lodged about half an inch below the middle of the posterior border of the left scapula, whence it was removed immediately after admission to the hospital. His sufferings from the effects of the second ball were great during the first month and a half. He was kept in a semi-recumbent posture, as the prone or supine condition would greatly increase the pain. On August 23d, he was removed to camp, a distance of three-fourths of a mile. The wound of head had apparently healed, and the wound beneath the clavicle suppurated slightly; the pulse was feeble and rapid. He was kept under the influence of morphia, and expressed a constant fear lest he might be freed from the power of the narcotic, and left exposed to the violence of pain in his chest. He was somewhat emaciated, but his appetite was good. Simple dressings were applied to the wound in the clavicular region. On September 5th, he was, apparently, fast sinking. Stimulants were given, which he was unable to bear. Even wine caused increased circulation and greater dyspnœa from coughing. The morphia was continued. On the 9th, diarrhœa set in, which was checked with diarrhœa mixture. On the 16th, patient was nervous and anxious; otherwise he was as usual. On September 25th, the wound of chest sloughed more freely, and the pain and dyspnœa had become intense. Morphia and balsam, with cough mixtures, were given. He complained a few times of pain in the head and neck. On September 30th, he was disconsolate and requested to be discharged "that he might go home to die." He was able to walk a few yards

from his bed and return. On October 10th, he had become perceptibly weaker, and died on October 20th, having survived his injuries four months and sixteen days. At the autopsy, the internal organs of the thoracic cavity were found in a normal condition, with the exception of the right lung, which was very much disorganized. The ball had broken off a splinter of the lower border of the clavicle, at a point below the outer attachment of the deltoid muscle, also a small portion of bone from the outer border of the first rib, and passing through the apex of the right lung in an oblique direction, made its exit between the fourth and fifth ribs, both of which were fractured near the spine. The ball in the head had fractured the ethmoid bone, and had extensively comminuted the sphenoid bone in its passage to the third cervical vertebra, where, impinging upon the right transverse process, it was found lodged and encysted in the muscular fibres of the rectus and scaleni muscles. The substance of the brain had not been injured in any way. The case is reported by Acting Assistant Surgeon A. L. Norris, who also contributed the specimen, No. 3851, Section I, A. M. M., a wet preparation of the third, fourth, and fifth cervical vertebræ, of which the anterior portion of the body of the fourth, on the left side, is fractured by a bullet.

Fractures of the Dorsal Vertebræ caused by gunshot were generally mortal, unless the lesion was confined to the apophyses. Wounds of the bodies of the vertebræ were usually associated with penetrating wounds of the chest or abdomen. Abstracts of a few cases of recovery after injury of the spinous, transverse, and articular processes are appended:

Case.—Private William Moran, Co. F, 22d Kentucky Volunteers, aged 28 years, was wounded, at Champion Hills, Mississippi, May 16th, 1863, by a ball from a canister-shot, which entered beneath and about the middle of the spine of the scapula, passed through the infra-spinatus muscle, came in contact with the spine, which it fractured, and entered the supra-spinatus muscle. He was treated in the field until June 4th, when he was taken on board the hospital steamer R. C. Wood, and conveyed to Memphis, entering Union Hospital on the 8th. The wound was explored in search of the ball, but it could not be found; fragments of comminuted spine were extracted. Large fragments still remained, attached by soft tissues, which were not removed. About June 26th, gangrene set in. Wound about two inches in diameter; edges black and sloughy; large slough quite deep in the wound. Nitric acid and poultices were applied, and large doses of morphine given to quiet the nervous system and procure sleep. Under this treatment the condition of the wound improved, and, by July 12th, was granulating finely. August 1st, wound filled with granulations to a level with the skin, and became much smaller. October 1st, wound completely healed. Patient in excellent health. He was returned to duty on December 7th, 1863.

Case.—Lieutenant James Sample, Co. B, 118th Illinois Volunteers, aged 35 years, was wounded at Edward's Station, Mississippi, July 1st, 1863, by a musket ball, which entered near the upper portion of the left scapula, passed between the first and second dorsal vertebræ, shattering the processes and injuring the spinal column, passed through the upper portion of the right scapula, entered the right cavity of the chest, and following the course of the first rib, passed through the right shoulder joint and emerged at the axilla. He was discharged from service at New Orleans on December 1st, 1863. Pension Examiner Charles Hay reports, on October 25th, 1865, that a gradual improvement is slowly taking place.

The next case is, if the diagnosis was indubitable, a very remarkable instance of recovery:

Case.—Corporal W. B. Weldon, Co. A, 13th Massachusetts Volunteers, aged 24 years, was wounded at Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal ball, which entered the left side between the eighth and ninth ribs, passed through the spine, touching the spinal cord, and emerged between the fourth and fifth ribs. He was treated in the field hospital until August 21st, when he was sent to the hospital at Camp Letterman. The wounds had nearly healed. September 12th, paralysis of the right leg. Stimulants were given and the limb rubbed with liniments from hip to ankle. On October 9th, he was transferred to Turner's Lane Hospital, Philadelphia, and, on January 13th, 1864, to Lovell Hospital, Portsmouth Grove, Rhode Island, whence he was discharged from service on February 2d, 1864. Acting Assistant Surgeon H. H. Dutton reported the case. Pension Examining Surgeon Geo. Stevens Jones reported, April 28th, 1864, that "the ball entered at the bend of the tenth rib, passed obliquely upward and out of left axilla, where it entered the left arm in its upper aspect, and was extracted at the middle of the arm. In consequence of the injuries to the back, he has some pain, besides suffering from other inconvenience. Disability one-half, not permanent."

Case.—Private Luther Weaver, Co. B, 126th New York Volunteers, aged 27 years, was wounded at Gettysburg, Pennsylvania, July 3d, 1863, by a conoidal ball, which entered the right lumbar region on a level with the tenth rib, passed across the spine, fracturing the spinous and transverse processes of the tenth dorsal vertebra, and lodged in the muscles on the left side. He was treated in the field hospital until July 24th, when he was sent to Camp Letterman Hospital. On admission, his general health was feeble. Cold-water dressings were applied to the wound and stimulants administered. Under this treatment, the patient improved very much. On August 5th, several spiculæ of bone were removed. He was transferred to Mower Hospital, Philadelphia, on September 15th, and returned to duty on November 25th, 1863.

Case.—Corporal *W. A. Freeman*, Co. B, 13th North Carolina Regiment, aged 24 years, was wounded at Williamsburg, Virginia, May 5th, 1862, by a musket ball, which entered two inches below the spine of the left scapula, passed upward and inward, and escaped midway between the spine of the right scapula and the right clavicle. He was admitted, on the 12th, to Cliffburn Hospital, Washington. A counter opening had been made in the track of the ball to the left of the vertebral column,

and from this and the orifice of exit the discharge of pus was profuse. Digital examination through the counter opening showed a shattering of the spinous processes of two of the dorsal vertebræ, and the existence of a large abscess over the muscles to the right of the vertebræ. A free transverse incision was made over the spine, the splinters of bone removed, sharp projecting points snipped off, and the carious portions gouged away. The cavity left was stuffed for two days with lint soaked in laudanum and subsequently with dry lint. The wound did very well. By July 3d, the wound had healed; the bullet holes were cicatrizing, and the cavity left by the operation was filling up with granulations. It was dressed lightly from the bottom with dry lint, the edges of the wound being approximated and supported by adhesive straps. By June 30th, the wounds had entirely healed. On July 11th, 1862, he was transferred to Old Capitol Prison.

Case.—Private Frederick Newman, Co. F, 81st New York, aged 18 years, was wounded at Drury's Bluff, Virginia, May 16th, 1864, by a fragment of shell, which fractured the spinous processes of the dorsal vertebræ. He was treated in the field, and, on May 19th, sent to Hampton Hospital, Fort Monroe. Simple dressings were applied to the wound. On July 14th, he was transferred to McDougal Hospital, Fort Schuyler, New York Harbor, and, on April 6th, 1865, to the hospital at Rochester, New York, whence he was discharged from service on June 12th, 1865. There was partial paralysis of the lower extremities.

Case.—Private Isaac N. Mitchell, Co. G, 8th Pennsylvania Reserves, received a gunshot wound directly across the back, injuring the dorsal muscles and spinous processes, and causing concussion of the spine, at Gaines's Mill, June 27th, 1862. He was treated in the field until August 26th, when he was transferred to the 1st division hospital at Annapolis. Returned to duty on January 30th, 1863.

Case.—Private William B. Morse, Co. A, 40th New York Volunteers, aged 20 years, was admitted to Stanton Hospital, Washington, June 15th, 1863, from the field hospital of the Army of the Potomac, at Potomac Creek. He said that he had been injured in the battle of Chancellorsville, May 3d, 1863, by the explosion of a shell; that he was lying on the ground on his right side, in line of battle, under a heavy artillery fire, when something hit him violently on the left side and knocked him senseless. When he came to, his mouth was filled with clotted blood. He spat blood for two days, with a cough which had not yet entirely left him. His left side was swelled up, and was tender from the armpit all the way down to the hip. He could not move the left leg at all, the thigh included, and had but partial use of the right one. Sensation also was nearly abolished in the left lower extremity. The motion and sensation of the left upper extremity were considerably impaired. He had not had any difficulty in holding or voiding his urine. He stated that the left side appeared to be badly bruised, but the skin was not broken. When admitted to hospital, the partial paralysis still continued and was most marked in the left lower extremity. He had dyspnœa and cough, but no expectoration. The left thorax was much shrunken and tender under pressure. The left shoulder had fallen down a good deal below the level of its fellow on the opposite side. There was lateral curvature of the spine, and his posture in bed bore a strong resemblance to that produced by pleurosthotonos of the left side. Nothing abnormal was detected by auscultation and percussion. There was no swelling or ecchymosis of the injured side, or evidence that the ribs had been fractured. He complained of much soreness in the walls of the left thorax and left side generally, and the motion of the left arm seemed to be much impaired on that account. His intellect was clear, and he presented no symptoms whatever diagnostic of a cerebral lesion. He was thin and rather pale; bowels constipated. He was manifestly suffering from the consequences of extensive contusion of the left side and concussion of the spinal cord. Dry cups were ordered to be applied daily over the spine and the bowels to be kept open with laxatives. He was allowed full diet. The dry cupping seemed to benefit him very much and the paralysis was rapidly disappearing. By August 15th, he was up and going about on crutches. The cups were discontinued, and acetate of strychnia prescribed in small doses. This remedy was discontinued at the end of a month, as it appeared to do him but little, if any, good. During the fall and winter he continued to improve slowly, and, by the middle of March, threw his crutches aside, preferring to walk with the aid of a cane only. April 10th, 1864: He stands erect; the falling down of the left shoulder, the shrinking of the left side, and the posture simulating pleurosthotonos have entirely disappeared. The left thigh is a trifle smaller and more flaccid than the right one. At times, he has a feeling of numbness and tingling in the left arm, but none in the right, and the same abnormal sensations in the left thigh and leg, but not in the right. He presents a curious limp in his gait in walking. His body sinks very low on placing its weight on the left limb, from deficiency in the power of the extensor muscles, as compared with that of the flexor muscles of the limb, to support the body at its proper height in walking, and thus a strange hobbling is produced like that in some cases of rupture of the ligamentum patellæ. He was discharged from service on April 18th, 1864.

Of fatal cases of gunshot injury of the dorsal vertebræ, there were numerous illustrations, with great variety in the character of the lesions, as the processes, laminæ, bodies, or spinal canal might be involved. Reasoning only from the cases that came under treatment, it would be admitted that gunshot fractures of the dorsal vertebræ had hardly a larger fatality than amputations of the thigh; but the many examples of immediate death on the field would then be overlooked. It will be remarked, in the abstracts that follow, that although those cases complicated by wounds of the great cavities often terminated fatally at an early date from the reception of the injury, those in which the spinous processes and laminæ were alone implicated were usually lingering and fatal from secondary causes.

Illustrations of these injuries are fully afforded by the specimens in the Army Medical Museum, and the abstracts of histories of over an hundred additional cases. Some of the more remarkable are here cited:

CASE.—Corporal William J. F———, Co. B, 1st Michigan Volunteers, was wounded at Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball, which fractured the second dorsal vertebra. He also received a wound of the left eye, and a scalp wound of the left side. He was admitted, on the same day, to the field hospital of the 1st division, Fifth Corps, and transferred, on May 9th, to Armory Square Hospital, Washington. The sight of the left eye was gone, and there was paralysis of the lower extremities. Death occurred on May 13th, 1863. At the necropsy, the ball was found to have lodged in the spinal canal. The right rib was shattered in its head. The right lung was very much congested. The pathological specimen is No. 1111, Section I, A. M. M., and was contributed, with a history of the case, by Assistant Surgeon C. C. Byrne, U. S. A.

Most of the fractures of the third dorsal vertebra were complicated by wounds of the thorax, as in the three following cases:

CASE.—Private *William L. B*———, Co. I, 21st Georgia, aged 22 years, received a gunshot penetrating wound of the chest at Fort Stevens, District of Columbia, July 12th, 1864. He was admitted, on the 14th, to Lincoln Hospital, Washington. When admitted, he was suffering intense pain in the chest; retention of urine and fæces; total paralysis, in lower extremities, of both motion and sensation; breathing, labored and painful; pulse, 100. Cold water dressings were applied, and opiates administered. He died on July 15th, 1865. At the autopsy a wound was found directly over the center of the left clavicle, made, apparently, by a bullet, but, on attempting to introduce the finger, it was found to be closed. The first rib was fractured at its greatest curvature, but was not entirely broken across. There was one hundred and eight ounces of bloody fluid in the thoracic cavity. The right lung, with the exception of a few recent adhesions on the posterior aspect of the lower lobe, was healthy. The left lung had a hole through it about one inch from the apex, through which the finger could be introduced. It was very much compressed by the fluid. The ball entered at the attachment of the rib to the third dorsal vertebra, the left transverse process of which it fractured, and was found lying against the left lamina of the fourth dorsal vertebra, which it had fractured from its pedicle, and by pushing it outward and backward had fractured the lamina of the opposite side and the spinous process. The pathological specimen is numbered 2343, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon H. M. Dean.

CASE.—Private Nathan P———, Co. G, 124th New York Volunteers, aged 18 years, was wounded at Spottsylvania, Virginia, May 10th, 1864, by a conoidal ball, which caused a penetrating wound of the chest. He also received a shell wound over the renal region. He was taken to the hospital of the 3d division, Second Corps; and, on May 16th, transferred to Lincoln Hospital, Washington, where he died on May 17th, 1864. At the autopsy, the ball was found to have entered two and one-fourth inches posterior to the right acromion process, and one inch below the spine of the scapula, causing extensive comminution of the spinous and transverse processes of the third, fourth, and fifth dorsal vertebræ of the right side, and corresponding ribs posterior to their angles, penetrated both lungs, and destroyed that portion of the spinal cord lying between the third and fourth vertebræ. The cord was also diffluent for one-half an inch above the third dorsal vertebra. Above and below these points it was entirely healthy. The fourth rib of the opposite side was fractured at its vertebral attachment. The ball was found in the posterior fold of the axilla. The pathological specimen is No. 2330, Section I, A. M. M., and was contributed by Acting Assistant Surgeon A. Ansell.

CASE.—Private James T. L———, Co. G, 18th Massachusetts Volunteers, aged 18 years, received a gunshot penetrating wound of the chest at Bull Run, Virginia, August 30th, 1862. He was treated in the field until September 12th, when he was sent to Master Street Hospital, Philadelphia. Death resulted on September 17th, 1862. Necropsy: The missile had entered over the head of the right humerus, splitting off a fragment of it, passed through, fractured the spine of the scapula, coracoid, and acromion processes, wounded the lung, driving spiculæ of bone into it, thence fractured the spine of the second and the right transverse process of the third dorsal vertebræ and emerged through the deltoid muscle, having passed through the left scapula at the base of its spine. The pathological specimen is No. 843, Section I, A. M. M., and consists of the second, third, and fourth dorsal vertebræ; the fragments are partly agglutinated by new deposit and the spiculæ are necrosed. It was contributed, with a history of the case, by Surgeon P. B. Goddard, U. S. V.

In the three following cases of gunshot fracture of the fourth dorsal vertebra, the usual symptoms of paralysis and functional disturbances of the alimentary canal and urinary organs were observed:

CASE.—Private Frank N. H———, Co. G, 101st Illinois Volunteers, aged 24 years, a muscular man, in excellent health, was wounded on board the ram "Switzerland," at Simmsport, Louisiana, June 3d, 1863, by a conoidal ball, which, passing through an oak plank two inches in thickness, entered the body about two inches above the inferior angle of the left scapula, and passed transversely upward and a little forward. Complete paralysis of the lower portion of the body immediately ensued. A small quantity of air escaped from the wound during the first hour, but none subsequently. The external hæmorrhage was slight, and but about four ounces of blood were ejected from the mouth. The respiration was but little affected, and the action of the heart somewhat increased. The introduction of a probe was quite impossible, the tendons and aponeurotic tissue presenting an impassable barrier. The patient was placed in bed in a sitting posture, supported by pillows and seemed to be quite comfortable. There was retention of urine and involuntary evacuations from the bowels on the following day, as also slight

fever. The expectoration of blood and mucus continued about twenty-four hours, becoming gradually less. On the 5th, the fever had somewhat abated and he expressed himself as feeling comfortable. On the 6th, he was transferred in an ambulance, over a very rough corduroy road, to the hospital steamer Woodford. A few hours after his transfer, he became delirious, and died on the morning of June 7th, 1863. At the autopsy, the ball was found to have passed upward through the transverse process of the fourth, and lodged in the canal opposite the third dorsal vertebra. The pathological specimen is No. 1630, Section I, A. M. M., and was contributed, with a history of the case, by Surgeon James Roberts, Mississippi Marine Brigade.

Case.—Private *Alexander L*———, Richardson's Partizan Cavalry, aged 18 years, was wounded at Warrenton Junction, Virginia, May 2d, 1863, by a small conical ball, which entered at the lower third of the scapula at its inner edge, passed obliquely downward and to the left, and lodged in the thorax. He was admitted, on the next day, to the Mansion House Hospital, Alexandria. On admission, he was found to have paraplegia and complete loss of sensation of all parts of the body below the fourth dorsal vertebra. Stimulants and tonics, with nourishing and sustaining diet, were given. On May 12th, pneumonia of the left lung set in, which rapidly passed into the third stage. His tongue was clean and appetite tolerably good, but his pulse was frequent and feeble. An expectorant was given, with an anodyne at bedtime. By May 20th, a cavity had formed in the lower portion of the left lung containing fluid. His appetite and strength were diminishing. On the 22d, several gangrenous spots appeared on the lower extremities. His urine and fœces passed continuously and involuntarily, the urine displaying the turbid appearance and strong ammoniacal odor so characteristic of lesions of the spinal cord. He continued to grow worse and died on May 27th, 1863. At the autopsy, the lower and part of the upper lobe of the left lung were found entirely destroyed and converted into sanious fluid, of which there were found three pints in the cavity of the pleura. The ball was found to have passed obliquely downward and forward, and lodged in the body of the fourth rib, fracturing, in its course, the spine of the fourth dorsal vertebra. The spinal cord at this point was found softened and disintegrated. The pathological specimen is No. 1660, Section I, A. M. M., and was contributed, with a history of the case, by Surgeon Robert Reyburn, U. S. V.

Case.—Private Oliver A. N———, Co. B, 13th New York Cavalry, aged 21 years, was wounded at Aldie, Virginia, July 6th, 1864, by a conoidal ball, which entered the right side below the nipple and lodged. He was treated in the field, and, on July 13th, sent to the 3d division hospital, Alexandria. On July 17th, gangrene appeared in the wound. Creasote was applied. Stimulants, anodynes, and tonics were administered, and nutritious diet given. Death occurred on July 23d, 1864. The autopsy revealed a fracture of the fifth rib, ulceration of the lower and middle lobes of the right lung, and the ball imbedded in the fourth dorsal vertebra. The pathological specimen is No. 3333, Section 1, A. M. M., and was contributed by Surgeon Edwin Bentley, U. S. V.

Among the specimens of gunshot wounds of the fifth dorsal are found examples of balls lodged in the body, penetrating the pleural cavity, perforating the lung, carrying foreign bodies before them into the substance of the lung, and causing effusions into the pleural cavity. The fifth observation will be remarked, because of the long interval between the reception of the injury and the fatal issue, when the bullet had traversed the spinal canal:

Case.—First Lieutenant *F. F*———, of Mosby's command, was admitted into the field hospital at Sandy Hook, Maryland, September 5th, 1864, with a gunshot fracture of the upper third of the right arm. There was no wound of exit. He died on September 20th, 1864, from pneumonia and secondary hæmorrhage. At the autopsy, the track of the ball was shown to have been in the long axis of the arm and down the chest. The pathological specimen is No. 3515, Section I, A. M. M., and shows portions of the dorsal vertebræ, with a pistol ball firmly imbedded in the body of the fifth, nearly the whole of which is shattered. The specimen is interesting from the fact of the injury not having been suspected during life. It was contributed by Acting Assistant Surgeon J. Younglove.

Case.—Private Lewis N———, Co. G, 5th Wisconsin, aged 20 years, was wounded in the left chest and left leg at Petersburg, Virginia, April 6th, 1865. He was taken to the hospital of the 1st division, Sixth Corps. On April 16th, he was transferred to the 1st division hospital, Annapolis; on May 10th, to the 2d division hospital; on May 23d, to Jarvis Hospital, Baltimore, and, on July 24th, to Hicks' Hospital. When admitted, the wound discharged large quantities of fœtid pus, evidently from the cavity of the chest. Tonics and stimulants were administered, with extra diet. The wound closed up, the ball remaining. Patient gradually failed. Emaciation was extreme, he being reduced almost to a skeleton. Death resulted on September 30th, 1865. At the autopsy, a conoidal ball was found to have entered at the middle of the posterior fold of the axilla, passed inward and downward, and slightly backward, lodging between the laminæ of the fourth and fifth dorsal vertebræ, the apex of the ball entering the spinal canal, but not pressing upon or interfering with the theca. The pleural sac had been opened between the angles and heads of the fourth and fifth ribs, left side. Outside of this point of opening, the callus had formed an arch between the angles, so that the finger passed over a smooth surface in approaching from the outside the point of opening of the pleura. The pathological specimen is No. 3171, Section I, A. M. M., and was contributed by Surgeon Thomas Sim, U. S. V.

Case.—Private George H. C———, Co. H, 64th New York Volunteers, aged 17 years, was wounded at Petersburg, Virginia, March 25th, 1865, by a conoidal ball, which entered midway between the centre of the left clavicle and the sterno-cleido-mastoid muscle, passed inward and backward, grazing the posterior portion of the upper lobe of the left lung, passed through the bodies of the third, fourth, and fifth dorsal vertebræ, and was found lying loosely on the sixth rib, right side. He was treated in the field hospital, and, on the 30th, was sent to Lincoln Hospital, Washington. Tonics and stimulants were

administered. Death occurred on April 5th, 1865. The necropsy revealed the course of the ball. The upper lobe of the left lung and the lower lobe of the right were found to be very much congested. There was some effusion on the right side. The pathological specimen is No. 4082, Section I, A. M., and was contributed, with the history of the case, by Acting Assistant Surgeon J. P. Arthur.

CASE.—Private Jacob N———, Co. F, 1st Maryland Volunteers, aged 26 years, was wounded at Hatcher's Run, Virginia, February 6th, 1865, by a conoidal ball, which entered the right side of the thorax, just beneath the spine of the scapula, and lodged. He was at once taken to the hospital of the 2d division, Fifth Corps, where simple dressings were applied to the wound. On the 11th, he was transferred to the National Hospital, Baltimore. An exploration of the wound by probing, only revealed an opening through the scapula, below which, examination was deemed injudicious on account of the proximity of the lung posteriorly. A few days after admission, tumefaction began near the spinal column in the cellular tissue covering it. This tumefaction increased until fluctuation became manifest. An incision of an inch in length was made at the point where the wall was thinnest, and about twelve fluid ounces of pus discharged. This discharge continued and was very profuse for about five days, when hæmorrhages supervened from the posterior opening. These occurred daily, and the patient gradually sank from exhaustion, and died on March 1st, 1865. At the autopsy, eight hours after death, the ball was found to have entered the scapula near the origin of the spinous process, passed forward, inward, and to the left, at an angle of 60°, struck between the angles of the fifth and sixth ribs, bearing more heavily upon the fifth; was reflected upward, forward, and to the left, breaking the spinous process of the fifth dorsal vertebra, and lodging under the rhomboid muscle, beneath the deep fascia of the left side. A large piece of blue cloth, carried into the wound, lodged on the right side of the spinous process. A sac, filled with black matter, in great part clotted blood, averaging in breadth, from two inches in the cervical region to three inches in the scapula and four inches in the dorsal and fourteen inches in length, extending from the fifth cervical to the first lumbar vertebra, was observed. On the left side, confined by the deep fascia, was an abscess, extending from the last cervical vertebra to the sixth dorsal, about one inch in length. Having cut through the lamina of the spinal cord, the spinous processes were removed. The large veins, near the lamina that was broken by the ball, were found. The torn extremities of a vein were found, white and old looking, near the point of injury. The spinal cord was thought to be somewhat thickened, and of an abnormal dark color. The pathological specimen is numbered 1080, Section I, A. M. M., and was contributed, with a history of the case, by W. G. Smull, Acting Assistant Surgeon.

CASE.—Private Henry F. W———, Co. H, 6th Michigan Cavalry, aged 48 years, was wounded in a skirmish near Winchester, Virginia, November 18th, 1864, by a minié ball, which entered at a point on the left side of the fifth dorsal vertebra, perforated the bone, injured the spinal cord, and made its exit on the right side of the chest, between the third and fourth ribs, without involving the lung. He was treated in field hospital at Winchester, and transferred to the hospital at Frederick, December 23d, 1864. When admitted, his general health was greatly impaired. Pulse very feeble, appetite poor, tongue pale, teeth covered with sordes, skin cold and clammy, and body considerably emaciated. The muscles of the thigh were atrophied. He had involuntary discharges of feces and urine, and there was a frightful sloughing bed-sore over the sacrum and one on each hip. Paraplegia was complete; respiration oppressive. He had some cough, with a muco-purulent expectoration. Upon auscultation, a bronchial respiration was noticed in the lower lobe of the right lung and in the upper lobe of the left lung; moist rales, likewise dullness over same upon percussion. Tonics, stimulants, and generous diet were administered, and counter-irritation applied externally. The bed-sores were ordered to be thoroughly syringed twice a day. After each dressing a poultice of yeast and charcoal was applied. The patient's general condition deteriorated. On January 3d, he became delirious; pulse, threadlike and almost imperceptible. He died on the same day. At the necropsy, upon removing the lungs, the lower lobe of the right was found to be completely hepatized, and the upper lobe of the left filled with tubercles, many of which were broken down, forming little abscesses. The fifth dorsal vertebra was removed and examined, and found to contain the track of the ball communicating with the medullary cavity. The transverse and spinous processes of this vertebra were broken off from its body, and the lower portion of the spinous process of the fourth vertebra, as well as the upper posterior portion of the body of the sixth. The ball passed directly through the spinal cord. The pathological specimen is No. 3850, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon J. C. Shiner.

Histories and specimens of two examples of gunshot fracture of the sixth dorsal vertebra were contributed:

CASE.—Sergeant *James F. H*———, Co. B, 60th Georgia Regiment, aged 24 years, was wounded at Petersburg, Virginia, March 25th, 1865, by a conoidal ball, which entered at the sixth dorsal vertebra, ploughed its way upward along the spinous processes, and imbedded itself in the third dorsal vertebra. He was treated in the field, and, on the 30th, sent to Lincoln Hospital, Washington. When admitted, there was complete paraplegia. Both fœces and urine passed involuntarily. Tonics and stimulants were administered. The patient did not suffer much pain, but gradually grew weaker, and died on April 4th, 1865. The pathological specimen is numbered 4083, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon J. P. Arthur.

CASE.—Corporal Thomas S———, Co. C, 205th Pennsylvania Volunteers, was received into the 3d division hospital, Alexandria, April 8th, 1865, having died on board the hospital steamer State of Maine, on the 5th. He had been wounded, probably before Petersburg, about April 1st. A necropsy was made; a conoidal ball had fractured the posterior portion of the right scapula for two inches, passed upward and fractured the sixth rib externally to its tubercle, passed through the arches of the fifth and sixth dorsal vertebræ, and lodged in the cervical portion of the left trapezius. The lower border of the right transverse process of the sixth, the spinous processes of both, and a portion of the left transverse process of the fifth had been carried away, and incipient caries existed in the body of the sixth. The pathological specimen is numbered 3230, Section I, A. M. M., and was contributed by Surgeon Edwin Bentley, U. S. V.

Among the gunshot wounds of the vertebral column, reported in detail, were several in which the seventh dorsal was chiefly involved:

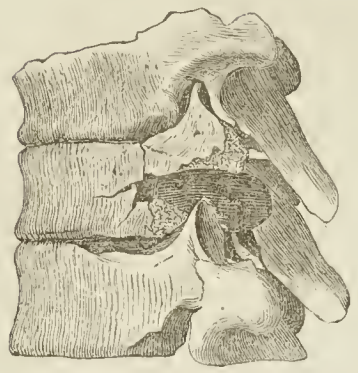

FIG. 190.—Gunshot fracture of the body of the seventh dorsal vertebra. *Spec.* 3030, Sect. I, A.M.M.

CASE.—Corporal George W. M———, Co. B, 53d Pennsylvania Volunteers, aged 19 years, was admitted into Harewood Hospital, Washington, June 7th, 1864, having been wounded at Cold Harbor on the 3d. A conoidal musket ball had entered near the inferior angle of the left scapula, and passing downward, inward, and forward, through the left lung, lodged in the vertebral canal after fracturing the transverse process of the seventh dorsal vertebra. The patient suffered from retention of urine and paraplegia; pneumonia also complicated the case. Owing to the extreme prostration, no active antiphlogistic measures were employed. The patient was kept in bed; fed on beef-tea, and quinine with whiskey, milk punch, etc. Stimulating frictions were frequently applied to the legs and hips, and the chest was enveloped in an oil-skin jacket. He died on June 19th, 1864. At the autopsy the ball was found imbedded in the substance of the seventh dorsal vertebra, encroaching upon the medulla spinalis. The lungs at their bases were hepatized, and near the apices were filled with a dark, frothy fluid. The pathological specimen, represented in the adjoining wood-cut, was contributed to the Army Medical Museum, with the particulars of the case, by Surgeon R. B. Bontecou, U. S. V.

CASE.—Captain Thomas H———, Co. A, 67th Indiana Volunteers, was wounded at Carrion Crow, Louisiana, November 3d, 1863, by a pistol ball, which entered about four inches to the right of the fourth dorsal vertebra. He was treated in the field hospital until November 9th, when he was transferred to St. James Hospital, New Orleans. Upon admission, there was partial paralysis of the left thigh and extremity. After the most careful examination the course of the ball could not be detected, and the tract of the spinal column, both above and below the wound being equally sensitive, no correct diagnosis as to location could be made, save that, from the symptoms, lesion of the cord had taken place. The paralysis, in the first week, invaded the right leg as well as the bladder and rectum, the only noticeable instance of excito-motory action being the peculiarity that tickling the glans-penis produced a partial evacuation of the bladder. This feature continued to the end of the case. Below the wound, the paralysis, for three weeks preceding death, was entire, of both the sensory and motory functions. The supervention of acute pneumonia proved the immediate cause of death, which occurred on December 19th, 1863. The *post-mortem* examination showed the ball to have passed downward and inward, slightly wounding the costal pleura and fracturing the right transverse process of the seventh dorsal vertebra, in the body of which it had lodged, producing a slight exfoliation from the inner wall of the canal, thus causing compression and inflammation of the cord; pus was found in the theca. The right lung was far advanced in suppuration. The pathological specimen is No. 2999, and was contributed, with a history of the case, by Assistant Surgeon S. H. Orton, U. S. A.

CASE.—Private Andrew C———, Co. C, 32d New York Volunteers, was admitted to Judiciary Square Hospital, Washington, May 14th, 1862, with a gunshot fracture of the transverse processes of the seventh and eighth and the spinous process of the eighth dorsal vertebræ; the sheath of the spinal cord was injured. When admitted, there was paraplegia, and hyperæsthesia of the crural nerves. He died on May 30th, 1862, from pyæmia. The pathological specimen is No. 796, Section I, A. M. M., and was contributed, with a history of the case, by Assistant Surgeon C. C. Byrne, U. S. A.

The Museum contains four specimens illustrating gunshot fractures of the *eighth* dorsal vertebra:

CASE.—Private Thomas C———, Co. G, 8th Illinois Cavalry, aged 30 years, was wounded at Upperville, Virginia, June 21st, 1863, by a musket ball, which entered the right side of the thorax, between the sixth and seventh ribs, two and a half inches below the nipple and two inches from the sternum, remaining in the body. He was taken to the Cavalry Corps Hospital, Army of the Potomac, and, on June 24th, transferred to Lincoln Hospital, Washington. The wound of entrance soon healed. An examination revealed the presence of fluid in small quantity in the left pleural cavity, with compression of the lower lobe of the lung. He did not complain of pain in the side, which varied very slightly in circumference to that of the right. The scapula of that side was almost motionless on respiration. Cough moderate; sputa none. He was troubled with a persistent diarrhœa, which assumed almost the same characteristic as the ordinary chronic diarrhœa, being accompanied with extreme emaciation, abdominal pain, scantiness of the secretions, and capricious appetite. In the latter part of November, the patient commenced to sink. A severe cough came on. Expectoration became profuse and sputa very offensive. Orthopnœa marked. His mind, however, was clear. The diarrhœa increased in violence. About December 1st, the person of the patient became very offensive. Delirium set in. Death supervened on December 9th, 1863. The autopsy showed the posterior portion of the right lung much compressed; the third lobe was carnified and the posterior portion of the lung covered with a thick layer of roughened lymph; between this and the pleura costalis was found one quart and two ounces of dark and offensive pus. The liver was covered on the peritoneal surface by thick adhesive bands. The kidneys were greatly congested. There was no ulceration of the intestines. The ball was found firmly wedged in between the head of the eighth dorsal vertebra of the right side and the corresponding rib. The pathological specimen is numbered 1954, Section I, A. M. M., and was contributed, with a history of the case, by Assistant Surgeon H. Allen, U. S. A.

CASE.—Private Andrew McConnell, Co. E, 30th Wisconsin Volunteers, was wounded at Camp Smith, Wisconsin, June 20th, 1863, by the accidental discharge of a gun, the wad from which entered just to the left of the spinous process of the eighth dorsal vertebra and lodged on the body of the vertebra, lacerating the parts very much, and producing severe concussion. He was taken to the regimental hospital, where the wad was extracted, and cold-water dressings applied to the wound. Entire paralysis of body below seat of injury. Death resulted on July 29th, 1863, from general exhaustion and debility.

CASE.—Private William H. C———, Co. H, 14th New York Artillery, aged 20 years, was wounded at Spottsylvania, Virginia, May 18th, 1864, by a conoidal ball, which entered at the spine of the right scapula, passed inward, fractured the fifth rib, the inferior part of the eighth dorsal vertebra, the lamina of the process, and superior articular process of the ninth dorsal vertebra, and lodged in the spinal canal. He was treated until May 26th, when he was sent to Douglas Hospital, Washington. When admitted, there was complete paraplegia and paralysis of both bladder and rectum. An abscess formed between the lung and thoracic parietes, which contained about six ounces of pus. He died on May 27th, 1864. The pathological specimen is No. 3530, Section I, A. M. M., and was contributed by Assistant Surgeon W. Thomson, U. S. A.

CASE.—Private Alexander McLain, Co. E, 7th Michigan Cavalry, was shot in the back, at Fairfax Station, Virginia, May 11th, 1863, by a rebel guerilla. He was admitted, on the 14th, to the regimental hospital of the 2d Pennsylvania Reserves. There was complete paralysis of the body from the shoulders to the feet; great dyspnœa and a continued desire to expectorate without being able; paralysis of bladder, with complete retention of urine. Constipation for the first four days, afterward involuntary stools. Skin dark-yellow, and, for several days, unusually hot to the touch. Death resulted on May 22d, eight days after the reception of the injury. Necropsy: The missile, a conoidal pistol ball, entered the back, fracturing, or rather crushing the spinous process of the eighth dorsal vertebra, passed into the spinal canal, and up through the medulla spinalis as far as the first cervical vertebra, where it was found almost entire but very much out of shape. Two small pieces had separated in its striking the spinous process, and were found imbedded in the transverse process. The lungs were congested and full of very dark blood. The bladder contained about four ounces of thick mucus-like substance.

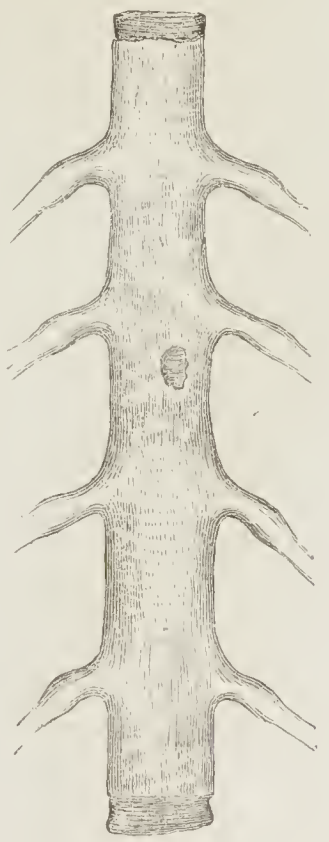

FIG. 191.—Segment of spinal cord ulcerated after injury. *Spec.* 3190, Sect. I, A. M. M.

There is also a specimen illustrating the results of spinal meningitis, from a gunshot injury of one of the dorsal. It is hardly practicable to determine which bone was injured:

CASE.—Private Thomas B———, Co. F, 122d Ohio Volunteers, aged 37 years, received a gunshot wound of the back, at the Wilderness, May 6th, 1864; the ball entered over the transverse process of the dorsal vertebra and lodged in the bone. He was sent to Washington, and admitted, on the next day, to Mount Pleasant Hospital. On May 15th, he was transferred to Jarvis Hospital, Baltimore, where he died on July 20th, 1864, from spinal meningitis. At the necropsy, the ball was found to have struck the body and fractured the transverse process of the dorsal vertebra. The bone was necrosed. The membranes of the spine, for two inches above and below the injury, showed unequivocal marks of intense inflammation and ulceration. The pathological specimen was contributed, with a history of the case, by Acting Assistant Surgeon B. B. Miles, Curator of Jarvis Hospital. It consists of a portion of the spinal cord, partially disorganized, as represented in the adjoining wood-cut (FIG. 191).

Instances of fractures of the spine by pistol and musket balls are illustrated in the Museum by four, involving the ninth dorsal mainly. In two of these the missile was lodged in the spinal canal:

CASE.—Private Frederick L———, Co. H, 8th New York Volunteers, aged 26 years, having been wounded at Cold Harbor, Virginia, June 3d, 1864, was sent to Washington, and admitted to Carver Hospital on the 11th. A missile had entered the right side of his back, and penetrated the vertebral canal, shattering the transverse and articular processes of the eighth and ninth dorsal vertebræ. The patient stated that immediately upon the reception of this injury he lost all sensation and power of motion below the wound. On admission, he was in a very feeble state; there was psychical depression, with slow pulse, labored respiration, cool, clammy, and cyanosed skin, and involuntary passages of the excretions. In this forlorn condition, he lingered until June 27th, when symptoms of extreme gastric irritability supervened, and every form of nourishment was promptly rejected by the stomach. He died on July 2d, 1864. At the autopsy, a conoidal musket ball was found imbedded in the vertebral canal. The cord appeared to have been completely severed at the seat of injury, and was disorganized above and below. A section of the injured vertebræ, having the ball in the canal, was forwarded to the Army Medical Museum, with the above account, by Surgeon O. A. Judson, U. S. V. It is represented in the accompanying wood-cut (FIG. 192).

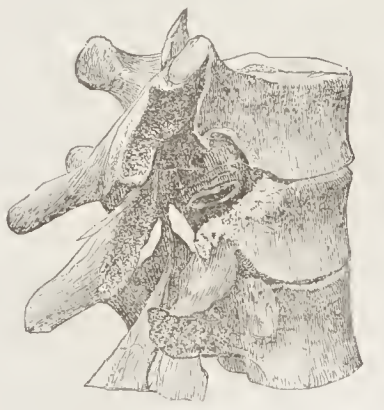

FIG. 192.—Conoidal musket ball lodged in the spinal canal between the eighth and ninth vertebræ. *Spec.* 2934, Sect. I, A. M. M.

CASE.—Adam W———, a political prisoner, aged 33 years, was admitted to Hospital No. 1, Nashville, Tennessee, March 3d, 1864, with a pistol-shot wound in the right side of the abdomen, received on February 10th, 1864, the ball lodging in the body of the ninth dorsal vertebra. He died on March 18th, 1864, from pneumonia. The pathological specimen is No. 2204, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon G. P. Hachenberg.

Case.—Private Silas B———, Co. E, 4th Vermont Volunteers, aged 23 years, was wounded at the Wilderness, Virginia, May 5th, 1864, by a bullet, which entered at the posterior margin of the left scapula. He was taken to the field hospital of the Sixth Corps, where he remained until the 13th, when he was transferred to Douglas Hospital, Washington. Traumatic pleuro-pneumonia soon appeared; the right pleural cavity became full of serum and paracentesis was about to be performed, when the serum found a free escape from the wound of entrance. The discharge of serum was profuse; the vital powers gradually became enfeebled, and he sank and died from exhaustion on May 21st, 1864. Necropsy: The ball was found to have passed downward and toward the right side, comminuting, in its course, the spinous processes of the lower dorsal vertebræ and the seventh, eighth, ninth, and tenth ribs, and lodged beneath the skin over the twelfth rib on the right side. The right thoracic cavity was partially filled with dark-colored offensive serum; the lung was covered posteriorly with a large layer of lymph. There was no consolidation of the lung, but it was stained, of a dirty greenish color externally, and was softened within. The pleura was lacerated by fragments of bone, and several spiculæ were removed from the thoracic cavity. The pathological specimen is No. 3524, Section I, A. M. M., and consists of the sixth, seventh, eighth, ninth, and tenth dorsal vertebræ. The right transverse processes of the seventh and eighth are carried away, and a fragment of the ninth is chipped off. A portion of the fragments of the fractured ribs are with the specimen. It was contributed, with a history of the case, by Assistant Surgeon W. Thomson, U. S. A.

Case.—Private Charles S———, Co. E, 87th Pennsylvania Volunteers, aged 20 years, was wounded on July 9th, 1864, at Monocacy, Maryland, and was admitted to hospital at Frederick, on the 10th. A musket ball having entered at the inferior border of the left scapula, passed inward and backward, and struck the spine, causing complete paraplegia. The urine, having been retained since the reception of the wound, was drawn off with a catheter. The wound of entry was dressed simply. The patient was allowed a generous diet, with one bottle of ale a day. He complained of no pain. The case progressed as follows—July 15th: Wound suppurating very little; slight excoriation over sacrum; patient placed on a water-bed; was catheterized for two days only; since then the urine dribbles away involuntarily; penis kept in the mouth of a urinal; appetite good. August 1st: Patient becoming somewhat emaciated; appetite failing; sloughing of lower extremities; urine and feces still passed involuntarily. In addition to other treatment, ordered a pint of sherry daily. September 1st: Gradual failing occurred during last month; sloughing extending; supportive measures still kept up. October 1st: Patient rapidly failing; treatment continued. October 13th: Died from exhaustion. Autopsy twelve hours subsequently: Body much emaciated; *rigor mortis* well marked; left lung much compressed, and cavity filled with sero-purulent fluid; right lung partially hepatized; abdominial viscera healthy. The posterior aspect of the entire dorsal vertebra seemed perfectly sound. Knowing, however, that the ball had injured the cord, a portion of the column, including the fourth, fifth, sixth, seventh, and eighth vetebræ, was removed. A section was then made through the fifth vertebra, which passed through the upper portion of the ball, which was found lying in the spinal canal. The ball had passed through the intervertebral notch between the ninth and tenth vertebræ, producing only a *very slight* fracture, and, turning downward, had lodged at that point. The upper end of the spinal cord was much softened. The pathological specimen, figured in the adjoining wood-cut, was contributed to the Army Medical Museum, with the history, by Acting Assistant Surgeon W. S. Adams.

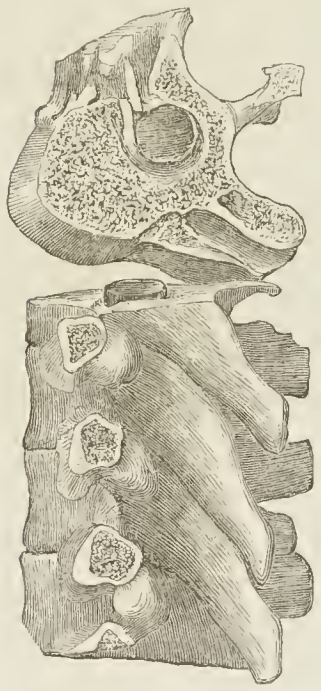

Fig. 193.—Conoidal musket ball lodged in the vertebral canal. *Spec.* 3984, Sect. I, A.M.M.

The specimens of gunshot fractures of the tenth dorsal preserved are from cases in which the cavities of the chest or abdomen were implicated:

Case.—Private John Blumm, Co. C, 1st Battalion California Mountaineers, was wounded in a fight with the Indians, at Redwood Creek, California, July 13th, 1863, by a round ball, which entered about two inches to the left of the spine, striking the tenth rib, running along it to the spine, cutting the articular processes, passing between and through, crushing the spinal marrow, and cutting the transverse processes on the right side, fractured the ninth and tenth ribs, and lodged against the spine, between it and the pleura. He lay on the ground twenty-four hours before receiving medical attention. He was then conveyed to Fort Humboldt, California, where he arrived on the 16th. There was paralysis of the rectum, bladder, and lower extremities. Stimulants were administered. Death resulted on July 31st, 1863. The necropsy revealed the track of the ball. The missile was found cut in two.

Case.—Private James S———, Co. B, 1st District of Columbia Cavalry, robust and well-developed, received a gunshot wound of the liver and spine, in a bar-room fracas in Washington, on October 18th, 1863. He was admitted, at two o'clock, A. M., October 19th, to Douglas Hospital. When admitted, the surface was cold and pale; pulse small and feeble; countenance anxious; great depression of the vital powers and pain at the seat of injury. This state of collapse, together with dyspnœa, and a peculiar rattling of the throat, as also a dullness of the abdomen, on percussion, indicated that internal hæmorrhage existed. The lungs were not implicated. The wound was a small hole, circular in form, depressed, of a livid color, and incapable of admitting the little finger. It was situated on the right hypochondrium, just below the cartilage of the tenth rib, one-fourth of an inch externally to the mammillary line. The wound was continually discharging a small quantity of venous blood and bloody serum. The patient was perfectly conscious. He complained incessantly of great coldness and pain near the wound. Upon removing his clothing it was found that alvine discharges passed involuntarily from him. Stimulants were given freely, and water dressings applied to the wound, with mustard poultices to the calves of the legs to restore the circulation of blood to the superficial skin. An anodyne was given. At nine and a half o'clock A. M., he had somewhat revived. The paleness was not so well marked, and his strength had rallied from the nervous shock. Death resulted at a quarter past eleven

o'clock P. M., October 19th, 1863. Necropsy: The ball had entered the anterior superior aspect of the right lobe of the liver, and, after traversing it inward, downward, and backward, emerged at the inferior posterior aspect, external to the vena-cava, penetrated the body of the eleventh dorsal vertebra anteriorly on the right side, passed obliquely upward and backward through the body of the tenth, completely shattering it posteriorly and breaking off the right pedicle, passed upward and to the left, and emerged through the left lamina of the ninth vertebra, resting against the corresponding rib. There was a considerable quantity of extravasated blood in the abdominal cavity. The lungs were congested, but otherwise healthy. The other organs were apparently intact. The pathological specimen, consisting of the last six dorsal vertebræ, is No. 2238, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon Carlos Carvallo.

Of gunshot fracture of the eleventh vertebra, the Museum possesses also a specimen in which the spinous process was carried away, and the right transverse process partially fractured. (*Spec.* 2737, Sect. I, A. M. M.) A special report was made of another gunshot fracture of this bone:

CASE.—Private *Joseph Bass*, Co. C, 43d North Carolina Regiment, was wounded at Winchester, Virginia, September 19th, 1864, by a conoidal ball, which fractured the eleventh dorsal vertebra. He was at once taken to the field hospital, where simple dressings were applied. Paralysis of the lower extremeties supervened, and death occurred on October 3d, 1864.

Of the specimens of gunshot injuries of the last dorsal vertebra, in the Museum collection, two are from patients who suffered from wounds of the thoracic or abdominal cavities as well, and one which is interesting as having been inflicted by a torpedo:

CASE.—Private W. A———, Co. F, 114th Colored Troops, aged about 25 years, large and robust, was shot at Brownsville, Texas, on the morning of January 28th, 1866, and was admitted to the post hospital. He died in thirty-eight hours. At the *post mortem*, it was found that the ball had entered two inches below and outside of the right nipple, gouged out its calibre from the upper border of the eighth rib, passed through the lower lobe of the right lung, the diaphragm, the right lobe of the liver, and lodged in the body of the last dorsal vertebra. The pathological specimen, shown in the accompanying wood-cut, was contributed to the Army Medical Museum, with the history, by Assistant Surgeon Ira Perry, 9th U. S. Colored Troops.

FIG. 194.—Pistol ball, calibre .37, lodged in the last dorsal vertebra. *Spec.* 3780, Sect. I, A. M. M.

CASE.—Private James M———, 2d New York Cavalry, aged 35 years, was admitted to the 2d division hospital, Alexandria, Virginia, October 28th, 1864, from the Orange and Alexandria Railroad depot, with a pistol shot wound of the left side of the spine, fracturing the twelfth dorsal vertebra, said to have been received in action. When admitted, he was much depressed; pulse about 130; tongue very thick and heavily coated; a great deal of pain over the abdomen and right side. His bowels had not moved for three days. There was incontinence of urine. All below a direct line from wound to pubis was paraplegic. About three pints of very thick and dark-colored urine were drawn off with a catheter. Stimulants, tonics, and a cathartic were given, with an anodyne at night. Under this treatment, he began to improve, and did well until November 15th, when a bad cough set in. On the 18th, in a fit of violent coughing, hæmoptysis occurred to the amount of a quart. Death occurred in one-half hour afterward. At the necropsy, upon opening the spinal column posteriorly from the second dorsal vertebra to the sacrum, the muscular tissue in the lumbar region was found to be very dark and softened. No abscesses or infiltrated pus could be detected in it. Upon removing the spinal cord the dura mater was found congested and firmly adherent to the vertebræ. The substance of the cord looked very red. The ball had passed between the arches of the twelfth dorsal and the first lumbar vertebræ, then through the body of the twelfth dorsal on the right side, outside of the spinal meninges. Its further track could not be traced. In making this examination, the cavity of the right pleura was opened and from it escaped about three pints of dark bloody fluid, which emitted a very offensive odor. The pathological specimens are numbered 3449 and 3500, Section I, A. M. M., and were contributed, with a history of the case, by Surgeon Edwin Bentley, U. S. V.

CASE.—William P———, a sailmaker's mate of the United States steamer Sciota, received an injury of the spine by the explosion of a torpedo, on April 14th, 1865. He was taken on board the United States steamer Tallahatchie and sent to hospital at Pensacola, Florida, where death resulted on May 5th, 1865. At the necropsy, the spinous process of the twelfth dorsal vertebra was found vertically fractured near its extremity, and the body of the vertebra transversely fractured, with comminution in its superior fourth. The fractured edges were necrosed. The pathological specimen is No. 2447, Section I, A. M. M., and was contributed by Surgeon P. J. Horwitz, Chief of the Bureau of Medicine and Surgery, U. S. Navy.

Gunshot Injuries of the Lumbar Vertebræ.—There were more than seventy recoveries after gunshot fractures of the apophyses of the lumbar spine. The following are examples that fairly illustrate this series. The complete recoveries were less numerous than the cases of those who survived but remained paralytic or troubled with fistulous openings, exfoliations, and abscesses:

CASE.—Private James McDonald, Co. C, 8th New Jersey Volunteers, aged 32 years, was wounded at Hatcher's Run, Virginia, April 2d, 1865, by a conoidal ball, which entered the right side, above the crest of the ilium, and lodged in the trans-

verse process of the first lumbar vertebra. He was taken to the field hospital of the Second Corps, and, on April 5th, sent to Douglas Hospital, Washington. Secondary hæmorrhage occurred on the 12th, which was controlled by compression. On the 14th, the ball was extracted. This man was discharged from service on September 11th, 1865. On October 20th, he was readmitted to Douglas Hospital by order of the medical director. Necrosis of the transverse process of the first lumbar vertebra was diagnosed. He was transferred to Harewood Hospital on November 2d, and finally discharged from hospital on November 9th, 1865. He is not a pensioner.

Case.—Sergeant James D. Hogan, Co. C, 1st New York Volunteers, was wounded at Manassas, Virginia, August 30th, 1862, by a conoidal ball, which entered two and one-half inches to the right of, and on a level with, the second lumbar vertebra, and lodged. He also received a gunshot wound of the right thigh. He was treated in the field, and, on September 3d, sent to Wolfe Street Hospital. No search was made for the ball as the patient assured the attending surgeon that it had been removed on the field. The wound seemed to heal, though very slowly until November 17th, when a small tent-like protrusion of exuberant granulations appeared, such as are usually seen at the orifice of a sinus leading to dead bone. The patient was unable to stand erect or lie on his back. The surrounding parts being considerably inflamed and the partially cicatrized wound reopening, a careful search was made for foreign matter. The ball was found about three inches from the point of entrance and removed by Acting Assistant Surgeon G. E. Fuller. The track of the missile was carefully explored and found to extend four inches in a direction forward and a little inward, where the point of the probe came in contact with spiculæ of bone. There was considerable tenderness over the whole of the lumbar vertebræ, but no paralysis or other symptoms indicative of injury to the spinal cord. This man was discharged from service on December 29th, 1862, at which time he was improving rapidly, although he was still unable to stand erect. The specimen is No. 4486, Section I, A. M. M., and consists of an elongated smooth-bore musket ball, much roughened on one side. The incrustation on the missile exhibits, under the microscope, spongy bone. It was contributed by the operator. Pension Examiners Craig and Porter, of Albany, report that this prisoner's disability may be rated as "one-half and permanent." He had "much pain and weakness of the back" in July, 1871.

Case.—Private Timothy Flaherty, Co. A, 1st Maryland Cavalry, aged 43 years, was wounded at Fredericksburg, Virginia, December 11th, 1862, by a conoidal ball, which entered the lumbar muscles a little to the right of the spine, passed forward, somewhat downward, and slightly inward, exposing a portion of the body and transverse process of the second lumbar vertebra. He was admitted, on the next day, to Stanton Hospital, Washington. There was complete paralysis of the lower extremities, both as to sensation and motion; the urinary bladder was also paralyzed. His general condition was favorable, and appetite excellent. Simple dressings were applied to the wound, and nourishing diet administered. Catheterization was resorted to, twice daily. During the month of January, 1863, he began to recover the power of using his limbs in bed to some extent. In February, the bladder had recovered its tone so that it was only necessary to use the catheter occasionally. During this month, the paraplegia continued to diminish slowly. The bullet came away in the dressings, having gravitated down from its place of lodgement, as the patient lay in bed. In March, electricity was applied, and diuretics, tonics, and purgatives administered. By April 6th, the patient was able to sit up, and stand with a little assistance. He had difficulty in the retention of his urine upon assuming the erect posture, which was probably occasioned by the prolonged use of the catheter. The urine was also scanty. On August 15th, he was furloughed. The wound had healed and he was able to walk with the aid of a crutch, April 4th: walks pretty well with the aid of a cane. The wound reopens at intervals, and after discharging awhile, closes again. On May 4th, the patient was transferred to Haddington Hospital, Philadelphia, and, on July 14th, to Turner's Lane Hospital, whence he was returned to duty on September 26th, 1864. Pension Examiner H. W. Owings, of Baltimore, reports, April 8th, 1867, that the patient was much debilitated, with an abscess discharging through a sinus in the right buttock, and that he could not stand without assistance.

Case.—Sergeant Joseph F. Lake, Co. A, 17th Maine Volunteers, aged 23 years, was wounded at Mine Run, Virginia, November 27th, 1863, by a conoidal ball, which entered the left side about two inches above the crest of the ilium, passed transversely through the muscles of the back, in its course striking the spinal column, and emerged very nearly opposite the point of entrance. He was taken to the field hospital of the 1st division, Third Corps, and, on December 5th, transferred to the 3d division hospital, Alexandria. Simple dressings were applied to the wound. Complete paralysis of the lower extremities and bladder existed for five months after the reception of the injury. He was discharged from service on April 15th, 1864. Pension Examiner Horatio N. Small reports, March 29th, 1867, "partial paralysis of the lower extremities; complete of the bladder; has to use a catheter whenever he passes urine. The integuments over the sacrum have sloughed away. A large sinus, connecting with this, opens in the right side of the perineum. He has a large ulcer on his right foot. I opened a large abscess in the back, which discharged a considerable amount of unhealthy pus. His general health is very poor; in fact he is a broken-down man. He can walk a little with two canes, but is incapacitated for performing any manual labor, and permanently so. Much of the time he requires the constant aid and attention of another person."

Case.—Private Edgar T. Harris, Co. A, 1st West Virginia Infantry, aged 19 years, while scuffling with a comrade, at Webster, West Virginia, March 15th, 1864, was wounded by the accidental discharge of his own pistol, the ball entering the right lumbar region, passing in an upward direction through the cylindrical portion of the third lumbar vertebra, injuring the spine to such an extent as to cause partial paralysis of the lower extremities. He was taken to the regimental hospital, where cold-water dressings were applied to the wound. The symptoms were unfavorable at first, but in a few days sensibility began to return to the lower extremities, and he was soon able to inform the attendants when he wished to pass fœces or void urine. On May 8th, he was transferred to the post hospital at Wheeling, whence he was returned to duty on May 9th, 1865. Acting Assistant Surgeon T. Kriker reported, April 28th, 1865, that he had carefully examined this man, and found him suffering from complete paralysis of the lower extremities, and that, in his belief, Harris would be permanently disabled. The pension claim was rejected on the ground that the wound was not received in the line of duty, but was afterwards allowed by a Joint Resolution of the Senate and House of Representatives.

Of fatal cases of gunshot injuries of the lumbar vertebræ, the Museum affords many illustrations. These examples were, of course, often complicated by wounds of the abdominal cavity:

CASE.—Quartermaster Sergeant Morris L———, Troop G, 18th New York Cavalry, aged 36 years, stout, well-developed, and of apparent good health, was shot (according to his own statement) on April 4th, 1864, at Compton, Louisiana, in an engagement with rebels. Being sent to New Orleans, he was admitted to University Hospital on the 10th. One inch to the right of the spinal column and about two inches below the edge of the last rib, a large gunshot wound was detected; careful probing indicated that the ball took a lateral and slightly downward course, penetrating the second lumbar vertebra. The patient was slightly delirious; pulse 130, small, quick, weak, and thready; face and prolabia pale and livid; eyes somewhat injected; tongue covered with a whitish fur; abdominal walls contracted, rigid, and tender on pressure; feces and water passed involuntarily. He was, with some difficulty, aroused from his stupor, and when asked how he felt and if he was in pain, would smilingly and good naturedly answer he was all right, felt no pain, and was anxious to rejoin his friends. It was directed that the patient be kept quiet, and take every third hour, one grain and a half of calomel, with three-fourths of a grain of pulverized opium, also a tablespoonful of "neutral mixture" every two hours, and be allowed a light diet. On April 12th, the patient was less delirious and complained of no pain; pulse, 110; but still weaker than on the two preceding days; the calomel and opium powders were omitted; "neutral mixture" was continued, with wine-whey and beef-tea *ad libitum*. Death occurred on the afternoon of April 18th. At the necropsy, twelve hours subsequently, a round iron ball, about an inch in diameter, was found imbedded in the cellular tissue investing the psoas magnus muscle of the left side. The missile, after penetrating the spinous process of the first lumbar vertebra, lacerated the spinal cord and emerged at the superior left lateral surface of this last-named vertebra. Purulent infiltration was found in the psoa muscles, their investments, and the peritoneal cavity. The lower lobes of both lungs were highly engorged, a condition probably only a *post mortem* result. Two small, circumscribed metastatic abscesses were detected in the right lobe of the liver. All other organs were in a healthy condition. The principal interesting feature in this case was the absence of paralysis in the lower extremities. The specimen was contributed to the Army Medical Museum by Surgeon Samuel Kneeland, U. S. V. It is shown in the adjoining cut (Fig. 195.)

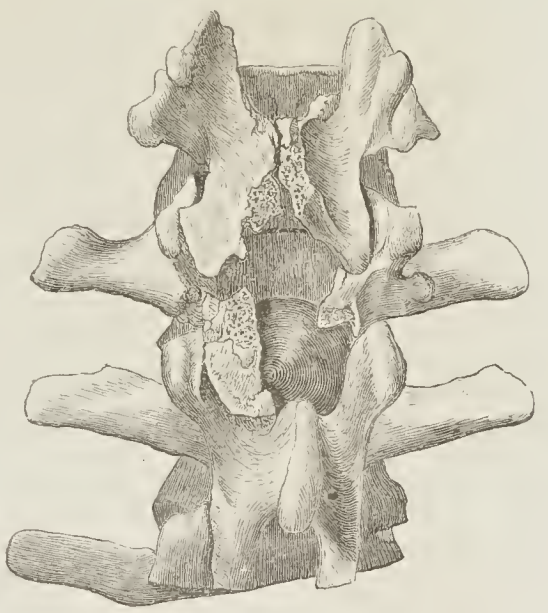

FIG. 195.—Lumbar vertebræ, with a cast-iron shot lodged in the canal. *Spec.* 3739, Sect. I, A. M. M.

In the following case the patient survived the injury for twenty-three days, though completely paraplegic:

CASE.—Private Luther W. C———, Co. G, 2d United States Sharp-shooters, aged 24 years, received a gunshot wound of the lumbar region, with injury to the spine, at North Anna, Virginia, May 23d, 1864. He was treated in the field hospital until the 29th, when he was sent to Finley Hospital, Washington, where he died on June 16th, 1864. Necropsy: The last dorsal and first lumbar vertebræ were found injured, the spinous processes being driven in, crushing the spinal cord. The pathological specimen is No. 2579, Section, I, A. M. M., and was contributed, with a history of the case, by Surgeon G. L. Pancoast, U. S. V.

The next is also a case of paraplegia:

CASE.—Private William S. L———, Co. K, 32d Iowa Volunteers, aged 32 years, was wounded on the skirmish line near Nashville, Tennessee, December 10th, 1864, by a conoidal ball, which entered the back on the left side, about three inches below the inferior angle of the scapula, fractured the eleventh and twelfth ribs, passed directly across the back, between the last dorsal and the first lumbar vertebræ, both of which it fractured, as also the eleventh and twelfth ribs on the right side, and lodged under the skin at a point almost corresponding to that of its entrance on the opposite side. The lower extremities were instantly paralyzed. He was at once conveyed to the Cumberland Hospital, Nashville, where the ball was extracted without any difficulty. There was no hæmorrhage of any importance. The patient was suffering considerably from the shock, but did not complain of pain, except in the right lung. Shortly after admission, the urine was drawn off by the catheter. He rested tolerably well during the night. December 11th: Urine drawn off several times during the day; had an involuntary evacuation of the bowels; some pain in the right lung from pleuro-pneumonia, which had set in. Anodyne fomentations were applied to the lung, and an expectorant and anodyne given at bedtime. On the 13th, the pneumonia was much better; the urine had to be drawn off three or four times during the day. The evacuations from the bowels were involuntary and unconscious, and great care had to be exercised to keep his bed clean. He felt tolerably well and suffered but little pain. There was no sense of feeling below the point of injury. The patient gradually lost his strength, although his mind remained clear up to the hour of his death, which did not occur until January 4th, 1865, twenty-five days after the reception of the injury. About ten or twelve days before his death, the tissues over the right trochanter and for a short distance down the thigh, began to slough away. The sloughing continued until the trochanter was exposed. It also commenced over the sacrum and left trochanter. Although the tissues were in this condition, he did not suffer the least pain. At the autopsy, ten hours after death, the lower lobe of the

right lung was found hepatized, and the posterior part congested; there were also some pleuritic adhesions. It was found that the ball had passed directly through the spinal cord, cutting it off. The pathological specimens are numbered 717 and 4710, Section I, A. M. M., and were contributed, with a history of the case, by Assistant Surgeon S. C. Ayres, U. S. V.

The following case has been already cited in *Circular* 6, S. G. O., 1865 (p. 28):

FIG. 196.—Two lumbar vertebræ fractured vertically. *Spec.* 3583, Sect. I, A. M. M.

CASE.—Corporal John E———, Co. M, 14th New York Heavy Artillery, being wounded in front of Petersburg, on July 30, 1864, was sent to Washington, and admitted to Douglas Hospital on August 3d, with peritonitis and complete paraplegia. He died on the same day. The autopsy revealed the passage of the bullet into the abdominal cavity through the spinal canal, and laceration of the liver. The pathological specimen was contributed to the Army Medical Museum by Assistant Surgeon W. Thompson, U. S. A. It is figured in the adjoining wood-cut (FIG. 196).

CASE.—Private James B———, Co. G, 1st Maine Cavalry, aged 19 years, was wounded at Petersburg, Virginia, April 1st, 1865, by a conoidal ball, which entered one inch to the left of the eleventh dorsal vertebra, and lodged. He was treated in field hospital until April 4th, when he was sent to Armory Square Hospital, Washington. There was complete paraplegia, and the patient suffered from incessant vomiting. A catheter was introduced to evacuate the bladder. Death occurred on April 12th, 1865, from nervous prostration. At the necropsy, the ball was found to have destroyed the spinous process of the twelfth dorsal, and a part of the right pedicle of the first lumbar vertebræ, and lodged in the spinal canal. A specimen, illustrating this injury, is No. 4093, Section I, A. M. M., and was contributed by Acting Assistant Surgeon C. H. Bowen.

CASE.—Corporal George Bowers, Co. D, 22d Pennsylvania Cavalry, aged 19 years, received a gunshot wound of the back at Winchester, Virginia, July 24th, 1864. He was treated in the field, and, on July 27th, sent to hospital at Sandy Hook, Maryland, whence he was transferred, on the 30th, to Jarvis Hospital, Baltimore. He died, on August 5th, 1864, of spinal meningitis. At the necropsy, the entire body was covered with the spots characteristic of purpura. The missile was found to have entered one inch to the right of the spinous process of the twelfth dorsal vertebra, passed through the transverse process, and embedded itself in the spinal canal. Pieces of clothing were found lying upon the cord, which was in a gangrenous condition. There was no paralysis during the progress of the case, except that of the bladder. All the internal organs were congested, especially the lungs, liver, spleen, and kidneys. There was slight effusion in the pleura of a strong urinous odor. Effusion in pericardium; heart very large. The endocardium was of a bright yellow color. Liver and spleen very large. Gall bladder empty. Kidneys large and fatty, the calices of each filled with clotted blood. The pathological specimen is No. 3185, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon B. B. Miles.

From the fatal gunshot fractures of the second lumbar vertebra, the following are selected:

CASE.—Private Joseph R———, Co. I, 86th New York Volunteers, stout, muscular, and aged 19 years, was admitted to Emory Hospital, Washington, August 25th, 1862, for a gunshot wound of the back, received on the night of the 22d. Notwithstanding great pain and restlessness, he gave an interesting account of the manner in which he was wounded, even laughing and jesting at times. He stated that, not thinking himself hurt, at the time of receiving the wound, he walked some distance to a tree where he sat and watched the enemy until near morning, when he walked into camp, and, on examination, "found a hole in his blouse and then a hole in his back." Being night when he was admitted, an anodyne was prescribed, and cold applications were applied to the wound. August 26th: passed a restless night, and morning found him wearied and anxious, very restless, with an occasional tetanic spasm, though not severe. He was now chloroformed, the wound was enlarged, and an unsuccessful search was made for the ball. The patient being removed to more comfortable quarters, an assistant and a nurse were left with him with directions to keep him partially etherized until more experienced surgical assistance could be secured. The services of Surgeon R. H. Coolidge were shortly obtained, and, after a trial of more than one hour, he succeeded in removing the ball, which was found firmly impacted in the canal and between the spinous processes of the first and second lumbar vertebræ. After carefully removing all spiculæ of bone, the wound was drawn together by adhesive straps, and cold-water dressings were applied. The administration of an enema of assafœtidæ and turpentine left the patient in a profound sleep, disturbed occasionally, however, by slight spasms of short duration. August 27th: bowels acted twice at night; micturition free and no symptoms of paralysis. There was marked increase in the severity of the tetanic symptoms. The enema was repeated, but had little or no effect in quieting the nervous symptoms. Chloroform was now brought to his relief and its use continued until ten o'clock A. M., when he died. At the autopsy, the ball was found to have destroyed entirely the spinous process of the second lumbar vertebra, and to have buried itself, apex foremost, completely in the vertebral canal, bruising and pressing upon the cord. The case is one of interest from the fact that no symptoms of paralysis followed such an injury to the spinal cord as was here received, and the ball was not turned in its course by the sharp edge of the spinous process. The pathological specimen, figured in the adjoining wood-cut, was contributed to the Army Medical Museum, with the above account, by Acting Assistant Surgeon S. R. Skillern.

FIG. 197.—First three lumbar vertebræ, with a conoidal ball which penetrated the canal and became impacted between the arches of the first and second. *Spec.* 611, Sect. I, A. M. M.

Case.—Private William B———, Co. B, 55th Massachusetts, was shot, while attempting to assault the provost guard, at Folly Island, South Carolina, November 11th, 1864, at four and a half o'clock P. M.; a conical ball entered the left side of the abdomen, midway between the crest of the ilium and twelfth costal cartilage, and lodged. The missile was fired at a distance of nine yards. There was instant and great pain in belly and small of back, with excessive shock. Consciousness unimpaired. Little external hæmorrhage. Copious vomiting of all the contents of the stomach, unmixed with blood, within one hour. Three grains of opium were given, with some relief from pain, but no sleep was induced. The extremities were very cold and could not be warmed. He died from collapse, six hours after the reception of the injury. Necropsy: Small intestine severed at two points, allowing the escape of contents. Descending colon bruised, but not ruptured, near external wound. There was about three pints of blood in the cavity of the abdomen, but no very large vessel wounded. The body of the second lumbar vertebra was perforated transversely, laying bare, but not injuring, the cauda equina. The ball was found, its base partially flattened, near a depressed fracture of the inner table of the ilium, near its crest. The pathological specimen is No. 3458, Section I, A. M. M., and was contributed, with a history of the case, by Assistant Surgeon Burt G. Wilder, 55 Massachusetts Volunteers.

Case.—Private John McD———, Co. K, 7th Michigan Cavalry, while in a state of intoxication, on July 1st, 1863, was wounded by a ball from a Colt's revolver (navy size), fired by the guard at the camp of the 1st Rhode Island Cavalry. The pistol was discharged at a distance of ten feet, the missile entering the left side, four inches below and a little to the right of the nipple. He dropped instantly, and upon attempting to remove him to a tent, it was discovered that he was wholly unable to move the lower limbs, and that below the anterior superior spinous processes of the ilium there was no sensation whatever, except a very slight sense of feeling when hard pressure was made upon the genitals. The shock and prostration were very great, and followed the injury immediately, while the system did not respond to the stimulants exhibited. It was found impossible to probe the wound to any extent, and one hour after the infliction of the injury, the patient was removed to Columbian Hospital, Washington. Up to this time no blood had issued from the mouth, nor was there any emphysema. Half an hour after admission, the patient commenced to vomit blood very freely. Although thirst was intense, he ejected the drinks given him almost as soon as swallowed. The vomiting of blood continued until four o'clock P. M , five hours after the injury, when it ceased altogether, although water was thrown up as before. The vomiting was spasmodic, and unaccompanied by pain. About this time some reaction took place, and the patient was comparatively comfortable until a quarter before eight o'clock P. M., when he became slightly convulsed, and expired in a few minutes. There were several respirations observed after the action of the heart had ceased entirely. He was perfectly conscious to the last moment. Necropsy: Ball passed inward and downward, going between the seventh and eighth ribs, through the diaphragm near its attachment upon the left side, thence through a fold of a dependant portion of the great curvature of the stomach, through the mesentery, and entirely through the body of the second lumbar vertebra, lodging in the deep muscles of the back. The spinal cord was divided. Both the thoracic and abdominal cavities were filled with bloody serum, while at the bottom of each were coagula of considerable size. With the exception of a few old pleuritic adhesions, the body was perfectly healthy. The pathological specimen is No. 1331, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon A. H. Crosby.

Case.—Private Theodore B. H———, Co. F, 7th Maryland Volunteers, received a penetrating gunshot wound of the chest and abdomen at Petersburg, Virginia, June 19th, 1864. He was taken to the field hospital of the Fifth Corps, where simple dressings were applied. On July 4th, he was transferred to the 3d division hospital, Alexandria. The ball had penetrated the lower lobe of the left lung, the symptoms being great prostration, difficulty of breathing, anxiety of countenance, slight hæmorrhage, and bloody expectoration. The patient was placed on his wounded side to favor discharge of blood and pus. No foreign matter was discovered. The hæmorrhage was controlled by rest and antiphlogistic treatment. Stimulants were carefully given. July 6th: Hectic fever set in. Opiates, tonics, stimulants, and beef essence. He sank rapidly, and died on July 9th, 1864. Necropsy: Ball entered between the ninth and tenth ribs, separated the former from its cartilage, passed through the lower lobe of the left lung, entered the abdomen, passed through the intestines without injury, and lodged in the second lumbar vertebra. The pathological specimen is No. 3349, Section I, A. M. M., and was contributed, with a history of the case, by Surgeon Edwin Bentley, U. S. V.

Case.—Corporal J. L. W———, Co. A, 2d Connecticut Heavy Artillery, aged 38 years, received a gunshot penetrating wound of the abdomen at Cedar Creek, Virginia, October 19th, 1864. He was treated in the field until October 25th, when he was sent to Patterson Park Hospital, Baltimore. The missile had entered about the ninth rib, on the left side, and passed out about the eighth rib, on the right side. When admitted, the patient was suffering from constitutional debility, but did not exhibit much distress otherwise. Simple dressings were applied to the wound and an anodyne administered. Death resulted on October 28th, 1864. Necropsy: The ball fractured the ninth rib on the left side, passed down through the diaphragm, perforated the spleen, then took a transverse direction through the body of the vertebræ, thence through the right lobe of the liver and out between the seventh and eighth ribs. The left side of the thorax was filled with blood and the left lung completely collapsed. The immediate cause of death was internal hæmorrhage from the splenic circulation and the wounds of the intercostal arteries, induced by mechanical violence. The pathological specimen, showing two dorsal vertebræ, the lower of which is deeply grooved on its anterior face, is No. 3471, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon A. Walsh Emory.

Of musket-ball fractures of the third lumbar, the Museum possesses eight specimens. The memoranda communicated with them are appended, with wood-cuts of two of the specimens:

Case.—Private Thomas D———, Co. F, 1st Michigan Sharp-shooters, aged 19 years, received a gunshot wound of the lumbar region, at Petersburg, June 24th, 1864. He was admitted, on the same day, to the field hospital of the 3d division, Ninth Corps, and, on July 1st, sent to Stanton Hospital, Washington. Stimulants were freely administered, with subcutaneous

injections of sulphate of morphia. Tetanus, in the form of opisthotonos and trismus, appeared on the 4th. Death resulted on July 5th, 1864. At the necropsy, a conoidal ball was found to have entered on the left side, over the posterior part of the crest of the ilium, passed upward and inward, and lodged in the left side of the body of the third lumbar vertebra. The anterior crural nerve was injured, as was also the lower end of the left kidney. There was limited peritonitis, and a small collection of pus, say a drachm, about where the ball impinged against the peritoneum, at lower end of kidney. The intestines were not injured. The pathological specimen is No. 2762, Section I, A. M. M., and was contributed, with a history of the case, by Assistant Surgeon George A. Mursick, U. S. V.

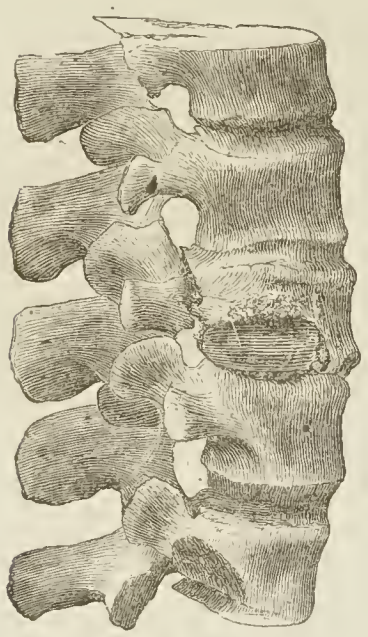

FIG. 198.—Lumbar vertebræ, the third fractured by a musket ball, which is attached. *Spec.* 2532, Sect. I, A. M. M.

The adjoining cut represents the lumbar vertebræ, with the third fractured by a conoidal ball, which is attached. The missile appears to have passed from the left directly through the intervertebral notch between the third and fourth vertebræ, chipping the superior articular process of the fifth and the adjacent portion of the spinous process of the fourth, fracturing the left transverse process of the fourth, and emerging through the body of that vertebra on the right side. Life continued long enough for incipient caries to present itself. The specimen was contributed to the Army Medical Museum by Surgeon John A. Lidell, U. S. V., without an history. A comparison of the specimen with the registers and case-books of Carver Hospital, and with Dr. Lidell's excellent paper *On Injuries of the Spine* (*Amer. Jour. of Med. Sci.*, October, 1864, Vol. XLVIII), does not permit a reference of this specimen to any of the histories recorded there. It corresponds closely to several of the recorded cases, and more than one history has been attached to it; but some vital discrepancy between the history and specimen has been subsequently detected. The history of the case that compares most closely with the specimen represents the patient as alive a fortnight after the preparation was on the shelves of the Museum; and, in other abstracts, where dates agree, there is discordance as to position and extent of lesions. The specimen was received from Stanton Hospital, June 18th, 1864.

CASE.—Private John J———, Co. K, 14th Connecticut Volunteers, was wounded at Antietam, September 17th, 1862, a ball entering the right side, three inches above the crest of the ilium. He lay upon the field until the 20th, when he was sent to Hospital No. 1, Frederick. When admitted, he could walk, but paralysis soon supervened. Retention of urine lasted for two days, after which there was no difficulty. There was no derangement of the alimentary canal. The pulse was small and weak; the face flushed, and the patient suffered greatly from bed-sores. On October 6th, he suffered great pain in the legs, which were without feeling, but warm. On the 10th, profuse sweats occurred; he sank rapidly, and died on October 11th, 1862. At the necropsy, a conoidal ball was found to have passed through the spine and spinal cord at the third lumbar vertebra, and lodged at the intervertebral notch on the left side. A specimen, consisting of the second, third, and fourth lumbar vertebræ, having a battered ball attached, is No. 757, Section I, A. M. M., and was contributed, with a history of the case, by Assistant Surgeon G. L. Porter, U. S. A.

CASE.—Private *T. J. R*———, Co. K, 7th South Carolina Regiment, received a gunshot wound of the lumbar region, about three inches to the right of the spinal column, at Antietam, Maryland, September 17th, 1862. He was treated in the field until the 27th, when he was sent to Hospital No. 1, Frederick. Patient became much exhausted, and died from colliquative fever on December 7th, 1862. The entrance made by the bullet had taken on a gangrenous character, some days previous to death. At the necropsy, on opening the walls of the abdomen and removing the intestines, a blackened and sloughing condition of the parts was observable in front of the spinal column, corresponding to the second lumbar vertebra, and, on the left side, an abscess existed in which the ball was found. The abscess was immediately in contact with the left kidney, but the latter was quite unaffected. Dissecting back the abdominal vessels and structures adherent to the vertebral column, an opening was found passing through the body of the third lumbar vertebra anterior to the transverse process, behind the aorta and in front of the cord, and communicating with the external opening and the sack on the left side of the column in which the ball was found. The spinal cord being uninjured explained the absence of all paralysis during life. The pathological specimen is No. 742, Section I, A. M. M., and was contributed, with a history of the case, by Assistant Surgeon James Phillips, U. S. A.

CASE.—Bugler William B———, Co. I, 1st United States Cavalry, received a gunshot penetrating wound of the abdomen, near Brandy Station, Virginia, August 1st, 1863. He was admitted, on the same day, to the hospital of the Cavalry Corps, Army of the Potomac, and, on the next day, was sent to Washington. He died in an ambulance, while being conveyed to Douglas Hospital. At the necropsy, a small bullet, as though from a carbine, was found to have entered on the right side, fractured the upper edge of the eleventh rib, a little internal to the axillary line, perforated the liver on the anterior and inferior surface of the right lobe, laterally, cut through the spleen, tore away its lower portion, cut into the left kidney, into which it impacted particles of bone, perforated the right kidney through the superior anterior edge, fractured the third lumbar vertebra, and emerged between the tenth and eleventh ribs on the left side, external to the axillary line. The omentum major protruded six inches in length from the wound of exit. The right thoracic cavity was filled with blood. The apparent cause of death was hæmorrhage from the liver. The pathological specimen of the fractured vertebra is No. 1647, Section I, A. M. M. The specimens of the liver and fractured rib are numbered 1646 and 3291, respectively. They were contributed, with a history of the case, by Assistant Surgeon William Thomson, U. S. A.

CASE.—Sergeant Sylvester R———, Co. B, 14th Indiana Volunteers, was wounded at Antietam, Maryland, September 17th, 1862, by a conoidal ball, which entered the left lumbar region, half-way from the twelfth rib to the crest of the ilium, and lodged. He was taken to the field hospital of the 3d division, Second Corps, where he remained until the 29th, when he was sent to Hospital No. 1, Frederick. On October 14th, the ball was extracted by Acting Assistant Surgeon Redfern Davies. Cold-water dressings were applied. Obstinate diarrhœa. No fœces passed from the wound. Paralysis of the sphincters of the

bladder occurred about October 20th, and continued until the 23d, when death occurred. Necropsy: The ball did not penetrate either the abdominal or peritoneal cavities. It fractured the left transverse process and pedicle of the third lumbar. The pathological specimen is No. 806, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon W. W. Keen.

CASE.—Private Elias H———, Co. E, 149th Pennsylvania Volunteers, aged 40 years, was wounded on May 8th, 1864, and, on the 18th, was admitted to Douglas Hospital, Washington, in a paraplegic condition, and died a few hours after. A conoidal musket ball had entered over the lower ribs of the left side, and, passing deeply in the muscles of the abdomen, lodged between the arches of the second and third lumbar vertebra and partially in the spinal canal, injuring the cord. The bladder was distended. The pathological specimen was contributed to the Army Medical Museum by Assistant Surgeon W. Thomson, U. S. A. It is represented in the adjoining wood-cut (FIG. 199.)

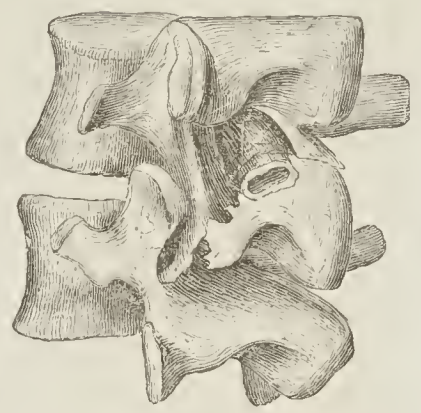

FIG. 199.—Third and fourth lumbar vertebræ, with a ball lodged between their arches and projecting into the canal. *Spec.* 3523, Sect. I, A. M. M.

CASE.—Sergeant W. W. C———, Co. H, 26th Massachusetts Volunteers, was wounded at Opequan Creek, near Winchester, Virginia, September 19th, 1864, by a conoidal ball, which penetrated the lumbar region through the erector spinæ muscle, right side, a few inches above the posterior crest of the ilium, and lodged. The left ankle and lower third of the left femur were shattered at the same time. On the next day, Surgeon James G. Bradt, 26th Massachusetts Volunteers, administered an anæsthetic and amputated the left thigh at its upper third by antero-posterior flap operation. The patient reacted promptly and did tolerably well, but remained very weak. Stimulants and nutritious diet were administered. On September 26th, he was sent to Sheridan Depot field hospital, Winchester. By October 31st, he had gradually become anæmic, but suffered no pain. There was partial paralysis of the right leg; no relaxation of the sphincters; appetite moderate; mental manifestations all intact; stump healing and in good condition. Death resulted on November 3d, 1864, from asthenia and anæmia, the ultimate occurrence of central nervous depression. The necropsy revealed adhesions of both lungs. The heart, liver, spleen, kidneys, and intestines were sound and normal. The ball was found lodged in the intervertebral articulation of the third and fourth lumbar vertebræ. Very little pus was found in the track of the ball. The pathological specimen is No. 3796, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon W. Leon Hammond.

Abstracts of histories of gunshot injuries of the fourth lumbar vertebra, of cases in which the pathological specimens are preserved, are introduced here:

CASE.—Sergeant Adam Heim, Co. G, 105th Pennsylvania Volunteers, was wounded at Malvern Hill, Virginia, July 2d, 1862, the missile entering the right lumbar region, two inches from the spinal column, fracturing the body of the fourth lumbar vertebra, and lodging close to the spinal canal. He was treated in the field until July 7th, when he was admitted to Carver Hospital, Washington. Feces and gas passed freely from the wound. Opium, quinine, and stimulants were given. He did well, the wound in the bowels closing, and his passages were natural until an officious friend gave him fruit surreptitiously, when diarrhœa supervened, and the wound reopened. He died on August 3, 1862. The pathological specimen is numbered 148, Section I, A. M. M., and was contributed by Acting Assistant Surgeon W. W. Keen, jr.

CASE.—Corporal L. P———, Co. F, 14th New Jersey Volunteers, aged 26 years, received a gunshot wound of the back at Monocacy Junction, Maryland, July 9th, 1864. He was admitted, on the next day, to the hospital at Frederick. Three days after admission, incomplete paraplegia set in. He suffered, at times, with excruciating pains at seat of wound and in the lower extremities. Anodynes were freely given. Patient had no control over the sphincter ani muscle. He was, at times, delirious. Pulse slightly accelerated. Death resulted on July 18th, 1864. At the necropsy, a conoidal ball was found to have entered at a point midway between the anterior superior and the posterior superior spinous processes of the ilium, one inch below the crest, passed inward and backward, chipped the sacrum at its posterior superior angle, fractured the fourth lumbar vertebra, and lodged in the canal. The pathological specimen is No. 3810, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon J. C. Shimer.

CASE.—Private John D———, Co. I, 26th Pennsylvania Volunteers, was wounded at Gettysburg, July 1st, 1863, by a conoidal ball, which entered the right side one inch above the crest of the ilium, passed inward and lodged. He was taken to the Seminary Hospital, Gettysburg, and, on the 12th, transferred to Broad and Cherry Streets Hospital, Philadelphia. When admitted, the wound looked well. The wound was probed for the ball, but without success. The bone was found bare, and a fracture of the vertebræ was diagnosed. The general condition of the patient was very fair; pulse, 88; tongue slightly furred, and bowels constipated. Neither paralysis of sensation or motion was perceptible, but he complained of severe pain in the wound. Nourishing diet was ordered, with an anodyne at night, and the wound was dressed with linseed poultices. Under this treatment, he appeared to improve until the 20th, when, without any perceptible cause, his pulse rose to 112; the wound became more painful. He was seized with a nervous trembling and very free diaphoresis, and began to sink rapidly. Milk punch was ordered, and counter-irritation made over the lower part of the spine, but without relief. The next day the symptoms had increased, and he was ordered a mixture of camphor and chloroform every four hours. He continued to sink, and died on July 24th, 1863. An autopsy was made eight hours after death, when it was found that the ball had entered the spinal column on the right side, at the articulation of the fourth and fifth lumbar vertebræ, just in front of their transverse processes, destroyed the continuity of the spinal canal, passed obliquely upward through the body of the fourth, and lodged in that of the third lumbar vertebra, on the left side. The pathological specimen is No. 2766, Section I, A. M. M., and consists of the first three and a section of the fourth lumbar vertebræ. Caries marks the track of the missile. The cord was impinged upon by a displaced fragment of the fourth vertebra. It was contributed, with a history of the case, by Acting Assistant Surgeon William V. Keating.

Case.—Private T——— K———, *alias* J——— B———, Troop A, 6th United States Cavalry, aged 28 years, married, was admitted to hospital at Austin, Texas, April 18th, 1866, from Belton, Texas, sixty miles distant, with gunshot wound of the posterior pelvis, received on March 26th; wound closed. He had been attended by a citizen physician, who made no efficient examination of the injury. Patient states that he received, while in the act of running, an accidental pistol shot (conical bullet, calibre .36 inch), instantaneously falling to the ground; the muscles of the lower extremities paralyzed; complete loss of sensation over entire posterior pelvis; that he was desirous of having the bullet searched for, as he should feel no pain from any incision. Otherwise learned that on the second day after the receipt of his injury, he complained much of pain across the sacral region and in the thighs; that he had lost almost entire control of his limbs from the haunches downward; could not change the position of the lower part of his body, and all attempts to move him by others gave great pain, especially across the lower portion of the back. His bowels were torpid; micturition continued under his control, but he lacked the expulsive power to readily accomplish it. After a few days, he was able to be placed up in bed with a chair and pillow at his back, and to move slightly the left thigh and leg; appetite increased; was quite cheerful, and thought to be recovering; could never rest the weight of the body upon the legs; shortly previous to removal to hospital, would slowly draw the legs after him when supported erect. Symptoms on admission: Much exhausted, having made the entire journey in an army wagon; looks emaciated and anxious; complains especially of pain in right sacrum, and of severe pain in the posterior muscles of the legs, aggravated by pressure. He cannot stand without support, and makes no attempt to walk. He slowly performs the act of flexion and extension of the legs, but cannot separate them when lying upon his side; superior extremities unaffected; eating but little; considerable thirst; bowels in an almost complete state of torpor; urine passed frequently and with much difficulty. He was ordered an opiate for the evening. Progress of the case: On the day succeeding admission, April 19th, he was ordered a mild diuretic in mucilage of flaxseed; dry cups to right sacrum, and a mild injection for the evacuation of the bowels. The application of the cups gave increased motor power from the hips downward, and on the second day, the patient was able to separate the knees when lying upon his side. Becoming rested from the fatigue of his journey, he thought himself to have decidedly improved; became more cheerful; was able to sit upon the side of the bed when placed up; but could only change his position by the management of the hands, and continued very weak. April 25th: Heavy beer, one quart administered; quantity divided during the day; urine passed with less difficulty, yet voided frequently. Having no increased tendency to motion of the bowels, he was, April 25th, also ordered a daily injection of cool water, and the use of strychina in small doses, combined with tonics; occasional cathartics required to relieve the torpor of the bowels, which responded more readily to croton oil than to other medicines of this class. May 5th: Wine, tablespoonful every three hours; beer discontinued. To this was early added the use of eggs. Beef essence was also given freely; little desire, however, for food. May 16th: Whisky, made rich with milk and eggs, substituted for the wine; dry cups continued. Under the use of strychina, substituted by the nux vomica, the bowels moved spontaneously, and power obtained to promply elevate the legs while lying on his back in bed, but made no attempt to walk. The medicine, however, readily exhibited its undue stimulating action, characterized by the patient as of diminished sensation from the haunches downward, with severe pain in the posterior muscles of the legs, and was discontinued; appetite has decreased, gradually becoming weaker. During the second and earlier part of the third week in May his general tone greatly diminished; the loss of sensation below the knees becoming almost entire, retaining, however, limited motor power. The power of expelling the urine was nearly lost; passed in drops, with continued painful desire to micturate; temporarily relieved by the use of the catheter (unable to retain catheter longer than a few minutes). In this symptom, the administration of belladonna in doses of one-fourth of a grain would, for quite a period, give the most decided relief. The patient lay chiefly upon his back, with the knees drawn up; pain in legs and sacral region increased; feces passed involuntarily; wet cups applied near the lower spine, once a day during four days, removing, at either time, for reason of his weakness, but a small amount of blood; no benefit whatever accruing, was discontinued; lungs in good condition. May 24th, rejecting all food; May 25th, active delirium; May 27th, had continued the use of the catheter twice daily; life only prolonged by the persevering use of stimulants; pulse, 120; respiration, 40, breathing almost exclusively with the diaphragm; continued delirium; no sensation in legs, except under hard pressure; continued to keep them flexed upon the thighs, and the thighs upon the pelvis; complained of intense pain in the back of pelvis and thorax, extending along the spine upward, making it difficult to rest the neck upon the pillow; described the pain as of lying upon hot embers; continued to cry out in pain until a few minutes before expiring, which took place on the morning of the following day, May 28th. Autopsy, twenty-one hours after death; assisted by Acting Assistant Surgeon R. M. Kirk. Cicatrix near posterior superior angle of the right ilium, some two inches from spine; track of wound passing rapidly toward the spinal column, fracturing slightly the superior border of the ilium, glancing upward over transverse process of the fifth lumbar vertebra, imbedding small particles of the bullet in its transit, and finally deflecting against the lower border the spinous process of the third lumbar vertebra, penetrated the spinal foreamen through the posterior arch of the fourth lumbar, separating the upper portion of the arch, and readily making its way by the elastic action of the ligamenta subflava, to which the upper border of the arch remained attached. Entering the foramen, the bullet again deflected, turning its point downward and resting within the fourth lumbar vertebra. In this position the bullet is not entire, a considerable portion being detached and lying within the upper section of the vertebra. Particles of lead were also found in the cavity of the sections. The bullet rested within the leash of nerves forming the cauda equina near the lower left angle of foramen, its point quite penetrating to the lower border of the vertebra; and, in passing to its position, had fractured the right inferior articulating process. The nerve tissue within was injured; vertebra reduced nearly to pultaceous consistence; the softening white; membranes surrounding the point of the bullet, lacerated, injected, and of a light venous color. The fourth and part of the third lumbar vertebra, with the ball attached, was contributed to the Army Medical Museum, with the above history by Assistant Surgeon C. Bacon, jr., U. S. A. The specimen is figured in the adjoining cut.

Fig. 200.—Fourth lumbar vertebra, with fragments of a ball impacted. *Spec.* 683, Sect. I, A. M. M.

Of gunshot fractures of the fifth lumbar, two cases may be recorded, in which the specimens have been preserved:

CASE.—Private James D———, Co. B, 5th Minnesota Volunteers, aged 21 years, received a gunshot penetrating wound of the abdomen at Nashville, Tennessee, December 15th, 1864; he also received a gunshot fracture of the bones of the face. He was admitted, on the same day, to Hospital No. 8, Nashville. When admitted, a large piece of the omentum, four inches in breadth by five inches in length, protruded from the abdominal wound. There was great depression and constant vomiting. The hernia of the omentum was reduced. He died on December 18th, 1864. At the necropsy, a conoidal ball was found to have entered three inches posterior to the anterior superior spinous process, one inch above the crest of the ilium, passed inward, penetrated the ilium at two points, slightly fractured the body of the last lumbar vertebra, and lodged in the right iliac fossa. There was intense peritonitis everywhere prevalent, the membrane being injected and of a red and green color, and, at many points over the viscera, layers of lymph were found. Fœcal matter, mixed with escaped blood, was found about the spinal column and in pelvic cavity. The right ilium was roughened and denuded. The pathological specimen is No 3750, Section I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon H. C. May.

CASE.—Private Michael H———, Co. D, 13th New York Volunteers, received a gunshot penetrating wound of the lumbar region at Gaines' Mills, Virginia, June 27th, 1862. He was taken prisoner and conveyed to Richmond, where he remained until July 27th, when he was paroled and sent to the hospital at Chester, Pennsylvania. About September 5th, he was sent, with others, to Fort Delaware, for insubordination, and thence was transferred to Sixteenth and Filbert Streets Hospital, on September 18th. From the first, he suffered no unusual inconvenience; the wound healed slowly but entirely, and the general symptoms were not sufficient to attract attention. On October 20th, after dissipation, he complained of pain in the left knee, at times very intense, depriving him of rest. The wound reopened and discharged freely; a slough formed over the lower part of the sacrum three or four inches in diameter, and so deep as to lay the bone bare. A lumbar and psoas abscess developed itself; the pain in the left knee increased greatly, and the leg became swollen and tender to pressure. The abscess in the loin was opened by a valvular incision, and three pints of pus evacuated with great relief to the pain in the leg and general improvement in the condition of the patient. The wound of entrance of the ball was very small, only admitting readily an eyed probe. About December 20th, both legs had become swollen, the left one red with local inflammation at its upper third. There was not, at any time, paralysis of motion or sensation of the lower extremities. There was no diarrhœa, and the stomach generally retained the anodynes, stimulants, and nourishing diet with which he was liberally supplied. He died of exhaustion on December 27th, 1862. The necropsy revealed an extensive abscess, reaching from the left kidney to Poupart's ligament. In the pelvis, in contact with the sacrum, was another abscess, while the tissues of the pelvis, at its back part, were buried in effusions of plastic matter. The ball was found lodged in the spinal canal, opposite the fifth lumbar vertebra. It had entered on the right side of the spinal ridge of the sacrum, about its middle, passed diagonally upward, and spent its force against the left wall of the canal of the first sacral and fifth lumbar vertebræ. The left lamina of the first sacral bone was carried away. The ball passed up the canal outside the theca of the spinal cord. The bodies of the fourth and fifth lumbar vertebræ were carious, and the intervertebral cartilage between them entirely destroyed, leaving a gaping space of the left side of the first and second sacral bones, which were necrosed and discolored, as was also the fifth throughout its thickness, and the cornea on its back parts. The first and second left sacral nerves seemed most involved by the diseased bones, but the lumbar plexus of the left side was entangled in its course in the diseased mass occupying the basin of the pelvis. The most remarkable feature of the case was that the ball should enter and occupy the spinal canal, pressing upon the spinal cord through its membranes without affecting the movement or sensation of the lower limbs. The complete closure of the wound, and the development of the disease in the bony structures that had received the shock of the ball, three months after the injury, was also worthy of remark. The pathological specimen is No. 1198, Section, I, A. M. M., and was contributed, with a history of the case, by Acting Assistant Surgeon George R. Morehouse.

A very complicated case, in which the lumbar vertebræ were implicated, but the thoracic and abdominal viscera as well, will be reverted to under the head of *thoracentesis*:

CASE.—Corporal Samuel Foulkrod, Co. G, 56th Pennsylvania Volunteers, aged 34 years, was wounded at the Wilderness, Virginia, May 6th, 1864, by a conoidal ball, which entered the back in the lumbar region, and lodged. He was treated in the field, and, on May 12th, sent to the 3d division hospital, Alexandria. It was thought that some of the vertebral processes were shattered. Several fragments of bone came away, and the wound healed very slowly. After the wound healed, abscesses formed in the sacral region from time to time, which gave vent to considerable purulent collections. He was transferred, on October 8th 1864, to the 102d company, 2d battalion, Veteran Reserve Corps. On February 11th, 1865, the patient had an attack of acute pleurisy. Wet cups were applied to the right chest, and six or eight ounces of blood withdrawn. This was followed by fomentations and purgatives, with an anodyne at night. February 12th: Abatement of febrile action. Effusion in right pleural sac, extending up to the fifth rib anteriorly. Patient placed in an upright position. February 20th, accumulation in right pleural sac has increased. Flatness, on percussion, as high as the third rib anteriorly; no respiratory act audible below this point. No dyspnœa. Decubitus on right side. Appetite fair; pulse 90, and soft. Patient complained of weakness. February 28th, marked increase of fluid in chest. On March 2d, a rapid accumulation was noticeable; complete flatness on right side, extending under. Liver depressed three or four inches. Apex of heart, two inches to the left of the nipple. Great dyspnœa; pulse, 130. Hectic fever, followed by profuse perspiration. The operation of thoracentesis was decided upon, and was performed by Assistant Surgeon Samuel B. Ward, U. S. V. A straight trochar was passed into the pleural sac between the fifth and sixth ribs, in the lateral region of the thorax, and fourteen and a half pints of healthy pus withdrawn. The patient experienced no faintness during the operation and felt greatly relieved. After the operation, the heart and liver returned to

FIG. 201.—Lower part of spinal cord lacerated at the dorso-lumbar junction. *Spec.* 150, Sect. I, A.M. M.

their positions. The condition of pneumo-hydro-thorax appeared, giving rise to the metallic tinkling and amphoric voice. Stimulants, anodynes, and nutritious diet, with absorbents, expectorants, and counter-irritants constituted the main treatment. During the month of March, the accumulation returned to a great extent, the dullness extending as high as the fourth rib. On April 1st, the incision of operation burst open, giving vent to over a pint of blood, and afterward continued discharging. Several abscesses were opened on the right thigh and leg. On April 15th, erysipelas appeared on the face, terminating favorably in a few days. On the 25th, he was transferred to the Sickel branch hospital, at which time he was gaining strength, and his case was very hopeful. Phthisis pulmonalis supervened, and death resulted on June 16th, 1865. The case is reported by Surgeon Edwin Bentley, U. S. V.

Before summing up the results of the entire series of cases of injuries of the spine, wood-cut illustrations may be introduced, that were not available when the abstracts to which they belonged were printed; and also a few more abstracts of the more remarkable and complicated injuries of the vertebral column. FIG. 201 represents the appearance of the lower portion of the spinal cord in the first case described on page 426, that of a soldier whose spine was fractured by the falling of a tree across his loins. The tubular nerve filaments have been curiously dissected out by the pus in which the cord was bathed, and form a leash. The fractured vertebra is represented in FIG. 202. The body is broken across nearly transversely; the spinous and left transverse process impinged upon the medulla. FIG. 203 has reference to the case of Sergeant C——, 26th Massachusetts, detailed on page 447. The ball, penetrating the thick lumbar muscles, shattered the right upper oblique process, and buried itself so deeply in the intervertebral space as to encroach but little on the canal; the patient survived the injury six weeks.

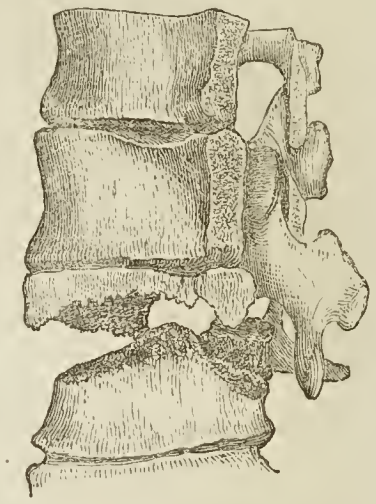

FIG. 202. — Transverse simple fracture of first lumbar vertebra. *Spec.* 149, Sect. I, A. M. M.

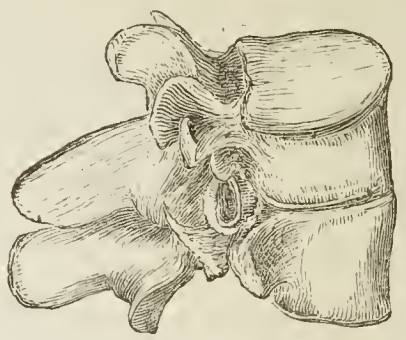

FIG. 203.—Third and fourth lumbar vertebræ, with a conoidal ball imbedded in the inter-vertebral disk. *Spec.* 3796, Sect. I, A. M. M.

To the five examples of partial recovery from gunshot fractures of the cervical vertebræ, recorded on page 405, at the beginning of this Section, may be added the following:

CASE.—Private Daniel Rich, Co. B, 55th Pennsylvania Volunteers, aged 21 years, having been wounded at the battle of Pocotaligo, October 22d, 1862, was admitted to Hospital No. 1, Beaufort, South Carolina, on the 24th. A ball had entered the sternum near the clavicular articulation of the left side and lodged in the spinal column. The patient spat blood in small quantities at the moment of the injury, but walked to the place of embarkation, a distance of five or six miles. He was obliged to lie on his back, and had lost power in both arms, to some extent. When admitted to hospital, his face was flushed and dusky, *coarse râles* were audible in the bronchia, and the pulse was accelerated. Tartrate of antimony, in doses of one-eighth of a grain, every four hours, was prescribed, with low diet, and wet dressings to wound. I did not deem it advisable to bleed, as the patient said his wound had bled much. October 25th: excitement of vascular system less; the medicine had sickened him, and acted on the bowels. A poultice was ordered, and medicine to be continued, with low diet. Decubitus dorsal, and arms lying by his side helpless, or rather unable to move them without pain in the shoulders; his spine seems perfectly rigid, and in being raised to take his food, which he does in a chair, he allows no one to touch him anywhere, except upon the head, and thus, as a stick, is lifted into the upright position. The cervical vertebræ are tender to the touch, as are also the upper dorsal vertebræ. October 26th: Much in the same condition; antimony continued; low diet, and poultice to wound. October 27th: Respiration easy; pulse nearly natural; wound suppurating. Antimony discontinued, and ordered half diet; feeling hungry. Continued much in the same condition until October 31st, when the soft parts covering the upper portion of the sternum had become red and fluctuating. The discharge could, with some difficulty, be forced out of the wound on the left side, but did not do so without assistance. I therefore made a free incision in this, and gave it vent. An opening into the chest, through the sternum, was apparent to the finger introduced through the wound; being feverish again, spirit of mindererus was ordered. A coarse rattle annoyed him very much, but subsided under that treatment. The wound discharges freely, and is doing well at this date,

November 4th, but the stiffness of spine and inability to move the arms remain. November 18th: The poultice was discontinued yesterday, and cerate dressings ordered. The patient can now move his arms somewhat, and sits up an hour or two daily. Cough disappeared suddenly, a week since. I think it was when he first sat up, and thus allowed the matter to run out that this symptom disappeared. Discharge is now very slight and healthy. December 1st, 1862: Rich has been walking around the ward since the 20th of November, and complains only of a feeling of stiffness in the spine and upper extremities. He walks as if all the parts above the pelvis were ossified together. Yesterday a small piece of bone came out of the opening over the sternum; it was evidently a portion of the sternum, and was of the size of a ten-cent piece. The three openings discharge but little, and are filled with very flabby granulations, which were penciled with nitrate of silver. A cerate cloth is kept to the wounds. December 20th: Rich has been doing very well since last report, sitting up much of the time, and occasionally walking about the room. Erysipelatous inflammation appeared to-day on the chest. December 27th: The erysipelas has successively invaded the chest, left arm, shoulder, and back, but is now disappearing. There is very little discharge from the wound. There still remains an immobility of the spine and arms, which prevents him helping himself much. December 28th: Sent to northern hospital, per steamer Star of the South. "Washington, D. C., November, 1865.—This man is now in the 1st battalion, V. R. C., to which he was transferred about a year since, and has done military duty since that time, and appears well at present." The above details were reported by Surgeon R. B. Bontecou, U. S. V. Rich was discharged the service on November 16th, 1865, and pensioned, his disability being rated total and permanent. Pension Examiner C. H. Rahter reports, under date of November 20th, 1868, that the patient's respiration is hurried, and he complains of constant pain in the chest. On May 3d, 1871 Pension Examiner S. M. Finley reports that "the wounds discharge freely every four or five months. There is great tenderness over the second rib; is much troubled with cough and breathes hurriedly. There is dullness on percussion, at the base of the left lung."

The following are examples of partial recovery after gunshot injuries of the dorsal or lumbar spine:

Case.—Private Alfred Frederick, Co. B, 16th New York Artillery, aged 18 years, was wounded at Chapin's Farm, Virginia, October 7th, 1864, by a musket ball, which entered at the dorsal surface of the left scapula, below the supra-spinous process, and emerged posteriorly and a little to the right of the second dorsal vertebra, fracturing, in its course, the spinous process of the scapula and second dorsal vertebra. He was taken to the regimental hospital, and, on the next day, sent to the base hospital of the Eighteenth Corps. On October 26th, he was sent to Hampton Hospital, Fort Monroe, whence he was returned to duty on February 6th, 1865. Pension Examiner A. P. Cook reports on August 5th, 1869, that there is inability to elevate the arm to the head, from adhesion of the muscular sheaths, incapacitating him from performing manual labor.

Case.—Private Nicholas T. Hall, Co. I, 1st Massachusetts Volunteers, aged 19 years, was wounded at Fair Oaks, June 1st, 1862, by a conoidal ball, which entered near the anterior superior spinous process of the left ilium and lodged in a lumbar vertebra. He was treated in the field until June 29th, when he was sent to Stone Hospital, Washington, whence he was discharged from service on August 26th, 1862. There was paralysis of the lower extremities. Pension Examiner George Stevens Jones reports, October 4th, 1862, "the ball has probably lodged in the vertebræ, and compressed the spinal marrow. The man is a great sufferer, and is incurable. Disability total.

The following abstracts relate to fatal complicated gunshot injuries of different parts of the vertebral column. It is unusual to find balls perforating the laminæ and dividing the cord with comparatively little injury to the osseous structures. The following is an example of such an injury:

Case.—Corporal W. N———, Co. C, 142d Pennsylvania Volunteers, having been wounded at Fredericksburg, December 13th, was admitted to hospital at Alexandria, December 19th, 1862. A ball had entered one inch and a half above the outer third of the right clavicle and lodged. The patient was weak, and had an anxious countenance; there was considerable dyspnœa, with a full but weak pulse, and suppuration from the wound was profuse. On December 23d, diarrhœa set in, attended with anorexia; otherwise the condition of the patient remained unchanged. The diarrhœa became worse by the 28th, and dyspnœa increased, the breath passing through the wound. The patient died on December 31st, 1862, with very great dyspnœa. At the autopsy, it was found that the ball had passed longitudinally through the inferior lobe of the right lung, impinged upon the body of one of the dorsal vertebræ, a splinter of which still adheres to the ball, and lodged under the greater curvature of the stomach. There was red hepitization of the injured lung, and a little pus was found in the thorax. There was nothing to indicate the occurrence of hæmorrhage. The treatment of this case was expectant. The missile was contributed to the Army Medical Museum, with the foregoing account, by Acting Assistant Surgeon G. F. French. It is represented in the adjoining cut (Fig. 204.)

Fig. 204.—Conoidal musket ball somewhat curved, with the apex obliquely flattened and a fragment rent off. *Spec.* 4483, Sect. I, A. M. M.

Case.—Private *R. H. Godwin*, Co. K, 31st Virginia Regiment, aged 26 years, was admitted into Chimborazo Hospital No. 1, Richmond, Virginia, with a gunshot injury of the spine, received on June 1st, 1864, the ball entering the first lumbar vertebra and ranging upward. He died June 3d, 1864. Paralysis did not occur. Surgeon P. F. Brown, P. A. C. S., reports the case.

Case.—Private Salvador Real, Troop F, 1st New Mexico Cavalry, was admitted to hospital at Fort Wingate, New Mexico, for a wound received in an attack by Indians near that post, on May 24th, 1865. A rifle ball had entered immediately below the spine of the right scapula, passed obliquely downward and inward, and entered the thorax through one of the right

ribs two inches from the vertebral column. The chief symptoms were inflammation of the right lung, high fever, and bloody expectoration. The treatment pursued was strictly antiphlogistic; bleeding, purging, sedatives, and spare diet. Death occurred on May 28th, 1865. At the autopsy, the right lung was found completely hepatized; the left lung was in a healthy condition. A number of splinters of bone from the fractured rib were imbedded in the right lung adjacent the wound, and a small quantity of lymph covered the lower and back part of the lung in proximity to the wound. The ball was imbedded in the body of one of the vertebra nearly opposite the wound of entry. The case is reported by Acting Assistant Surgeon Charles A. McQueston.

CASE.—Private John Lowe, Co. C, 31st Indiana Volunteers, aged 23 years, was wounded at Pittsburg Landing, Tennessee, April 7th, 1862, by a conoidal ball, which entered near the clavicle to the left of the sternum, and lodged near the spine on the same side. On April 11th, he was admitted to the hospital at Mound City, Illinois. Hæmoptysis for first four days. Severe pain in lung and labored respiration. Arterial sedatives were given, with an anodyne at night. On April 28th, he was transferred to Hospital No. 4, Evansville, Indiana. The ball had been extracted previous to admission. On May 2d and 16th, hæmorrhage occurred from the large vessels in upper part of chest. He bled from the mouth and posterior wound in both instances, and became much reduced in strength without syncope supervening. Astringents of acetate of lead and opium were given, with mild antiphlogistics, and quiet ordered. The wounds healed. Death resulted August 14, 1862, from paralysis, referred to necrosis of the spinal column. The case is reported by Surgeon E. C. Franklin, U. S. V.

FIG. 205.—Third, fourth and fifth cervical vertebræ, showing gunshot fracture of the fourth and fifth. *Spec.* 4086, Sect. I, A. M. M.

CASE.—J. W. B———, was killed on April 26th, 1865, by a conoidal pistol ball, fired at the distance of a few yards, from a cavalry revolver. The missile perforated the base of the right lamina of the fourth cervical vertebra, fracturing it longitudinally and separating it by a fissure from the spinous process, at the same time fracturing the fifth vertebra through its pedicle, and involving that transverse process. The projectile then traversed the spinal canal almost horizontally, but with a slight inclination downward and backward, perforating the cord, which was found much torn and discolored by blood. (See *Specimen* 4087, Sect. I, A. M. M.) The ball then shattered the bases of the left fourth and fifth laminæ, driving bony fragments among the muscles, and made its exit at the left side of the neck, nearly opposite the point of entrance. It avoided the large cervical vessels and the filaments of the second and third cervical nerves. These facts were determined at the autopsy, which was made on April 28th. Immediately after the reception of the injury, there was very general paralysis. The phrenic nerves performed their functions; but the respiration was diaphragmatic, of course, and labored and slow. Deglutition was impracticable, and one or two attempts at articulation were unintelligible. Death, from asphyxia, took place about two hours after the reception of injury.

The next is an abstract of a case complicated by tetanic symptoms. Others have been recorded on pp. 444 and 445, *ante*.

CASE.—Private John Ratteo, Battery C, 5th United States Artillery, aged 28 years, was wounded at Gettysburg, July 1st, 1863, by a conoidal ball, which entered below the spine of the left scapula, and lodged in the angle between the spinous and transverse processes of the eighth dorsal vertebra, fracturing, but not displacing the spinous process. After being wounded, he walked to the field hospital without assistance, and was able to move about and help himself until the 6th, when clonic spasms of the abdominal muscles and diaphragm set in, which continued steadily increasing in intensity. Anæsthetics were administered, and the urine was drawn off by a catheter. On the evening of the next day, he fell into a sleep, upon awaking from which the spasms returned, and continued until death, which occurred at eleven o'clock P. M., July 7th, 1863.

Gunshot injuries of the vertebral column are, of course, very serious The following table shows that more than half of those cases that came under treatment were fatal; and many who suffered from such injuries must have rested on the field:

TABLE XIX.

Results of Six Hundred and Forty-two Cases of Gunshot Injuries of the Vertebræ.

REGION.	Cases.	Died.	Discharged.	Duty.	Unknown.	Per centage of Mortality.
Cervical	91	63	19	8	1	70.0
Dorsal	137	87	32	18	.....	63.5
Lumbar	149	66	51	28	4	45.5
Cervical and Dorsal	2	1	1	.....	.....	50.
Dorsal and Lumbar	3	3	.....	.....	.....	100.
Vertebræ not stated	269	129	72	50	9	51.4
Aggregate	642	349	175	104	14	55.5

Among the cases enumerated in the foregoing table,—which includes those of which abstracts have been given,—the following complications were noted:

Musket balls lodged in bodies or apophyses of vertebræ in such a manner that their precise position could not be ascertained, or else so impacted that all efforts for their extraction were fruitless. Several such examples are figured in the preceding pages of this Section. (See FIGURES 190, 192, 193, 194, 195, 196, 197, 198, 199, 200, 203.) The total number reported, of such cases, was seventy-three: Twelve in cervical region, with eight deaths, two complete recoveries, one discharge with slight disability, and one undetermined case; thirty-four in the dorsal region, of which thirty-one were fatal, one recovered, one discharged, one with result unknown; twenty-one of the lumbar region, with sixteen deaths and five discharges for disability; six in which the region was not specified, with three deaths, two discharges, and one recovery. In fifty-four cases of gunshot injury of the vertebræ, complicated by traumatic lesions of the cord, forty-two were fatal, and twelve partially recovered and were discharged, with various degrees of physical disability. The cases of contusion and commotion of the spinal cord are not included in this category. Abstracts of fourteen of the fatal cases have been printed in the foregoing pages. One of these, the second on page 439, in which the patient is reported, by Surgeon E. Donnelly, 2d Pennsylvania Reserves, to have survived eight days, after a conoidal pistol ball had passed into the spinal canal through the apophyses of the eighth dorsal and upward "through the medulla spinalis as far as the first cervical," is so extraordinary, that the authority, accidentally omitted, is here recorded. The fifty-four cases, where injury of the cord is mentioned, cannot possibly include all in which that complication existed In the Army Medical Museum alone, there are fifty-two specimens of gunshot injuries of the spine involving the cord, nearly all procured from cases included in Table XIX. The Museum contains seventy-six specimens showing the results of gunshot fracture of the vertebræ.* In nineteen cases primarily fatal, the cord escaped injury in four only; in fifty-seven examples of secondary pathological conditions, the cord was involved in thirty-seven. Estimating the relative frequency of injury to the cord, in gunshot fractures of the vertebræ, by the fatal cases alone, the percentage would be 71.0. Paralysis is mentioned as a prominent symptom in only one hundred and fifty-one of the six hundred and forty-two cases enumerated in the table. Making every allowance for the considerable proportion of cases in which the lesions were confined to the apophyses, it must be regarded as probable that this complication was not always noticed when present. There were not a few instances in which paralysis was absent even where the cord was injured. (See CASES of J. R——, p. 444; J. D——, p. 447; M. H—— p. 449; *R. H. Godwin*, p. 451.) All of these were examples of injury of the lumbar vertebræ.† In the case of Bowers (p. 444), there was no paralysis, except of the bladder. The occurrence of *bed-sores* is noted in twenty-two of the six hundred and forty-two cases, eleven terminating fatally. In fourteen cases, of which twelve terminated fatally, injuries of the vertebræ were complicated by wounds of the lung. In fifteen cases the abdominal cavity was penetrated; there was a single partial recovery. Abstracts of some of the fatal injuries of the spine, complicated by penetration of the thoracic or abdominal cavities or both, have been cited on pp. 441, 442, and 446, *ante*. In several instances the lung, diaphragm, liver, spleen, or kidney, were implicated.

* See *Cat. of Surg. Sect.* A. M. M. p. 57, *et seq.*

† See Mr. Shaw's paper in Holmes's *System* (*Op. cit.* Vol. II, p. 388), for four interesting cases of total absence of paralysis in fractures of the lower lumbar region.

Tetanus supervened in seven cases of gunshot injury of the vertebral column. Chloroform, hypodermic injections of morphia, and the extract of Calabar bean internally, with stimulants and nutritious enemeta, were the medicinal agents generally employed.

Pyæmia is noted as a complication in eight of the three hundred and forty-nine fatal cases recorded in Table XIX.

Dyspnœa is alluded to, either directly or by implication, principally in cases of gunshot injury of the cervical vertebræ, and in many of those of the dorsal. Mr. Shaw[1] in his able paper on injuries of the spine, calls attention to the fact that respiration is not exclusively diaphragmatic in injuries of the cervical portion of the cord, for although the intercostal and abdominal muscles are paralyzed, the serratus magnus, supplied by the external thoracic nerve (Bell's external respiratory), and other muscles of the outside of the chest, are powerful auxiliaries in inspiration, and, indeed, in expiration also; for the action of these muscles is to elevate the upper ribs to which they are attached, and to expand the chest, and, when they relax, the ribs falling from the elasticity of the thorax, the lungs are compressed and both actions of respiration are thus aided. Brodie[2] explains the occurrence of dyspnœa in injuries of the dorsal spine by the removal of the power of the abdominal muscles to aid in expiration. The air not being completely expelled, mucus accumulates and cannot be expectorated, and the blood is imperfectly oxygenated. Mr. Shaw points out the additional reason that distension of the hollow viscera by gases is permitted by the deprivation of the compression normally exercised by the muscles, and that tympanitis thus produced disturbs the respiration mechanically.

Dysphagia is noted in a number of cases, the complication being generally dependent upon wounds of the muscles of deglutition rather than injury of the nerve trunks.

Costiveness was the general rule in these injuries, in the early stages; but when the lower portion of the cord became disorganized, paralysis of the sphincter and involuntary fæcal discharges were common, a phenomenon clearly explained by Mr. Hilton.[3] Disorders of the *urinary organs* are frequently referred to. Retention of urine, requiring the habitual use of the catheter, was often followed by incontinence, if the patients lived long. The occurrence of suppression of urine or of diabetes, referred to by authors, was not noted. Hæmaturia is reported in a single case, in which the kidney had shared in the injury of the vertebra. The secretion of mucus and ammoniacal urine is often alluded to, and in two instances cystitis was pronounced the proximate cause of death.

Priapism is reported in three cases only, all of the cervical region.[4] It will be readily understood that the figures cited here and throughout this analysis of the table by no means furnish an exact estimate of the number of instances in which a given rational symptom was present; but state simply how often it was *noted*. The reports were generally, of necessity, too brief to admit of a full review of the clinical phenomena.

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[1] *On Injuries of the Back.* In Holmes's *System of Surgery*, 2d ed., 1870, Vol. II, p. 392.

[2] It would appear that this remark can only apply to cases of injury below the origin of the sixth cervical nerve.—*Compiler.*

[3] Guy's Hospital Reports, Vol XI, 3d series.

[4] Another case is reported in *Circular* 3, S. G. O., 1871, p. 129.

Section III.

OPERATIONS.

A few cases of ligations, on account of secondary hæmorrhages, a number of ball extractions, and removals of fragments of bone constituted the examples of operative interference resorted to in the wounds and injuries of the spine. The number and results are exhibited in the following table:

Table XX.

Results of Sixty-two Operations after Gunshot Fractures of the Vertebræ.

OPERATION.	REGION.	Cases.	Died.	Discharged.	Duty.	Unknown.
Ball removed	Cervical	1	1			
Do. do.	Dorsal	12	4	7	1	
Do. do.	Lumbar	16	5	7	3	1
Do. do.	Not stated	5	3	1		1
Bone removed	Cervical	5	2	2	1	
Do. do.	Dorsal	6	2	1	3	
Do. do.	Lumbar	9	4	4	1	
Do. do.	Not stated	4	2		2	
Ligations		4	4			
Total		62	27	22	11	2

Ligations.—The complications of injuries of the spine by hæmorrhage were not numerous. In seventeen only, of the six hundred and forty-two cases enumerated in Table XIX, is this complication noted as of importance; fourteen of the cases had a fatal termination. In a complicated case, not included in the table, of gunshot wound of the lower jaw, tongue, and pharynx, the first on page 355, the left transverse process of the third cervical vertebra was fractured. The coats of the vertebral artery wore away against the jagged margin of the fracture; on the eleventh day there was copious hæmorrhage, for which the common carotid artery was tied. Seven days subsequently hæmorrhage recurred and was promptly fatal, the bleeding point being vainly sought for. It would be difficult to adduce a more striking illustration of the soundness of Guthrie's precept on this subject. Apart from this case which has been recorded in a previous category on account of its complications, in four other instances only were important vessels secured:

Case.—*Ligation of Occipital Artery.*—Private Joseph Horton, Co. D, 57th Massachusetts Volunteers, aged 23 years, was wounded at North Anna, May 18th, 1864, by a conoidal ball, which entered the external ear, and passing inward and downward,

lodged in the first dorsal vertebra. He also received a gunshot wound of the right hand. He was conveyed to the field hospital of the Ninth Corps, where the thumb and forefinger were amputated. On May 24th, he was transferred to Harewood Hospital, Washington. Secondary hæmorrhage occurred from the right occipital artery on May 31st; the artery was ligated by Surgeon R. B. Bontecou, U. S. V., on the same day. The hæmorrhage recurred on June 2d, when re-ligation was performed. Death resulted in about three hours after the second operation. The case is taken from the Harewood Hospital reports.

Though the surgeon followed the generally accepted practice* in the following case, one cannot refrain from a feeling of regret that an attempt, at least, was not made to place a double ligature on the internal carotid at the part wounded. If successful, it would have been a glorious achievement, and it could not have had a worse result than the Anellian operation that was adopted:

CASE.—*Ligation of Common Carotid for Gunshot Wound of the Internal Carotid.*—Orderly Sergeant Vincent L. Keiflin, Co. K, 105th Pennsylvania, was wounded at Gettysburg, July 2d, 1863, by a conoidal ball, which entered the right side of the neck, just below and posterior to the ear, and lodged. He was treated in the field until July 10th, when he was sent to the hospital at York. His name does not appear on the register of the Third Corps Hospital, where most of the wounded of his regiment were treated. On the 12th, a severe hæmorrhage occurred from the wound, and could not be controlled by the ordinary means. The right common carotid artery was tied by Surgeon Henry Palmer, U. S. V., on the 13th. The patient died on the morning of July 14th, 1863. *Necropsy:* The internal carotid artery was nearly severed at the point where it enters the skull. The right arch of the atlas was shattered, and its fragments pressed on the vertebral artery. Three pieces of the ball were extracted. The case is reported by Acting Assistant Surgeon H. F. Bowen, in charge of the case books of York Hospital. The medulla appears to have escaped all injury.

In the next case there is no indication of the source of bleeding; but it was probably a leison of some of the vessels in the axilla, as the operator would hardly have tied the left subclavian within the scaleni, without specifying the fact:

CASE.—*Ligation of Left Subclavian.—A. C. Howard,* Confederate, aged 19 years, received at Fair Oaks, a gunshot wound on May 31st, 1862, the ball passing through the left shoulder, injuring the spine and causing paralysis. On June 7th, the left subclavian artery was ligated on account of hæmorrhage. He died on June 18th, 1862. [The case is reported by Dr. H. L. Thomas, in the *Confederate States Medical and Surgical Journal,* Vol. I, p. 186.†]

The following case, reported by Assistant Surgeon Robert F. Weir, U. S. A., is very instructive:

CASE.—*Diffuse Traumatic Aneurism; Wound of the Spinal Cord; Ligation of the Carotid; Death; Autopsy.*—"In the afternoon of September 30th, 1862, I was requested to see in consultation, by Surgeon Thurston, U. S. V., and Acting Assistant Surgeon C. P. Herrington, at Frederick Hospital No. 4, Private Henry Herman, 12th Pennsylvania Reserves, aged 23 years, who was wounded at the battle of Antietam, by a buckshot, which had entered on the right side of the neck on a level with the upper portion of the thyroid cartilage and on the anterior margin of the sterno-mastoid. Of his history prior to his entrance into this hospital, September 24th, little could be ascertained, but the following was obtained from the patient. On the 29th instant, some hæmorrhage had occurred, twelve days after the reception of the injury. The bleeding had been checked, as was thought, by plugging the small opening of the wound with lint saturated with *liquor ferri persulphatis.* A pulsating tumor then rapidly formed and extended so that at four o'clock P. M. of the same day it had reached from the maxilla to the clavicle, and from the sterno-mastoid to the median line. Although the course of the missile was unknown there had resulted paralysis of the right leg and partial loss of the functions of the right arm. There was no indication of urinary trouble. At the hour of consultation the tumor was reported to have increased much in size and had now crowded the trachea considerably to the left side. The covering of the false aneurism was tense, and pulsation and a harsh thrill were detected on palpation. The plug of lint remains in yet, held firmly by clotted blood. The mean pulse was 65 and irregular, but became quiet—probably from the amount of *veratrum viride* that had been given him, to wit: from eleven o'clock A. M. (it now being five o'clock P. M.), eight drops every one and a half hours. The respiration was slow and irregular, and somewhat violent and humid, with lividity of the face. Even if the cord had been injured by the shot, which was not thought probable by many of the assistants, it was decided to operate, since death was imminent from the recurrence of the severe hæmorrhage, and I was requested to perform the operation. Having carefully assigned their duties to my assistants, the lint plug was removed, and immediately the wound was enlarged by me, with probe pointed instruments, sufficiently to admit my two fingers to the bottom of the cavity. I was so fortunate as to reach and compress the opening in the artery with very little difficulty, and thus effectually control the hæmorrhage, which at

* I think that it is unfortunate that the last edition of *Gray's Anatomy* (2d Holmes, London, 1866, p. 356), a work in the hands of so many students, should recommend the ligation of the common carotid for wounds of the internal carotid.—*Compiler.*

† In connection with this case, Dr. Thomas, who did much of the statistical work in the Confederate Surgeon General's Office, remarks: "In many of the reports the data are so meagre as not to furnish any satisfactory conclusions with regard to the gravity of the case. Brevity is a very commendable feature in clinical reports, but should not be pushed to the extent of robbing the case of its interest. 'Alexander died—Alexander was buried;' but there are some people who would be curious to know how he died and when he was buried; and it is a lean obituary that does not give these small items."

first had been quite profuse, though of short duration. Throughout the whole of the protracted operation, it was noticed with what ease the bleeding from the artery was checked—so little pressure was required. The clots were now turned out and the incision prolonged downward to the clavicle, and upward about one inch—the length of the entire incision being three and one-fourth to four inches. Owing to the obscurity of the tissues from infiltrated blood and the displacement of the parts from pressure, great difficulty was experienced in securing the artery above and below the opening, which the end of the forefinger neatly closed. It was only after long and repeated attempts that the proximal part of the carotid was exposed and a ligature placed around it by means of Mott's aneurism needle. The finger at this time became accidentally displaced from the opening, and it was noticed that the blood welled from the upper carotid for five or six seconds before jetting. The ligature of the distal portion was then applied, which entirely checked the bleeding. At the time the first ligature was applied, great disturbance in the respiratory movements occurred, suggesting the idea that the pneumogastric nerve had been included in the ligature. After ten or fifteen minutes they became more regular. It was noticed also, but freely after six ligatures been applied, that hemiplegia of the left side had taken place, with tendency to sleep; patient was easily aroused, and that the right arm alone was movable; deglutition, however, was not impaired. The opening in the artery was plainly visible after the ligation. It was oval in shape, and about a quarter of an inch long. Almost eight ounces of blood had been lost, being much less than anticipated from so formidable an operation, which had occupied more than two hours. Six and a half o'clock P. M.: At the tumefaction, pulse 66, and of moderate force; respiration ranging from 36 to 48. No other symptoms appeared to justify the idea of a ligation of the pneumogastric nerve. Vision of both eyes was unimpaired, though the left pupil did not contract upon exposure to strong light; the condition of the pupils, prior to the operation, had not been noticed. Seven and a half o'clock P. M.: The trachea had returned to its normal position. Is taking one-half ounce of brandy every fifteen minutes; pulse 95, and a little weak. Is still somnolent, and an involuntary evacuation of the bowels has taken place. October 1st, fifteen minutes past six o'clock A. M.: Quite a severe hæmorrhage occurred, which, however, was easily arrested by the application of *liquor ferri persulphatis* by the surgeon in attendance. This was thought to have originated from some vessel divided during the operation. Paralysis continued the same, indicating cerebral lesion. The patient gradually sank, becoming more profoundly immersed in stupor and although both pupils acted regularly when exposed to light, at twenty-five minutes past two o'clock P. M. he died. The autopsy, made twenty-four hours after, revealed the following facts: Rigor mortis tolerably well marked. The skin was black from the jaws to the second rib on the entire right side, and the whole body greatly puffed up. A careful dissection of the neck on the right side was made. Everything was found greatly disarranged and displaced by reason of the false aneurism and the operation. All the veins were immensely distended with air, though no injury to their calibre was discovered. The omo-hyoid had been divided. The descendens noni nerve was not found, but the communicans noni nerve was uninjured. Neither the internal jugular vein nor the pneumogastric nerve were found to be included in the ligature, nor did the nerve seem to have been affected through its proper sheath by the persulphate of iron, as was thought might have occurred. On examining the artery it was found that the ligature had been applied three-eighths of an inch above and five-eighths of an inch below the wound, but the upper one was somewhat loose, perhaps enough so as to account for the recurrence of the hæmorrhage after the operation, though, as it controlled the hæmorrhage at first, it seems more reasonable to suppose that the hæmorrhage came from the superior thyroid, which had itself, or some of its branches, been divided in the operation The wound was made in the sheath on the inner side, three-eighths of an inch below the border of the superior thyroid cartilage and one-eighth of an inch below the bifurcation of the artery. It was about three-eighths of an inch long and nearly as broad, with a narrow connecting band running longitudinally. The walls of the artery seemed healthy, save immediately about the wound. The three lower cervical and two upper dorsal vertebræ and the cord were exposed by sawing through the laminæ. The shot had entered the spine anteriorly, and at the lower edge of the sixth cervical vertebra of the right side, just internal to the vertebral artery, which was uninjured. It penetrated the cord and was found within the theca in the median line, just above the lower border of the seventh cervical vertebra, posteriorly Just within the cord, at the point of entrance of the shot, was a spicula of bone about a quarter of an inch long. The membranes of the cord for three-eighths of an inch above and below the lodgement of the ball were found inflamed. The brain was found, in the middle lobe of the right side, to be softer than that of the left. Just to the right of the lamina cinerea, where the middle lobe overlaps the anterior, was a spot, of about one inch in diameter, where the substance of the brain was greatly disintegrated, and in a liquid condition. It had almost formed an abscess—otherwise healthy. The specimens were preserved."

Removal of Fragments of Vertebræ.—Of formal trepanning of the vertebræ no instances were reported, but a few examples of the extraction of recent spiculæ from the apophyses; of exfoliations and necrosed portions of the bodies and processes of the vertebræ; and even of operations for the removal of fractured fragments from the lateral and posterior portions of the apophyses, were recorded. In the preceding Section, on page 433, abstracts are given of the cases of Moran, Weaver, and Freeman in which fragments were removed after gunshot fractures of the dorsal vertebræ. All of these patients made excellent recoveries. The operator in the case of *Freeman*, Assistant Surgeon J. S. Billings, U. S. A., has since mentioned that quite large portions of bone were removed. Scanty particulars of some of the other cases included in Table XX are appended:

Case.—Private Thomas Wells, Co. C, 20th New York Militia, aged 21 years, was wounded at Gettysburg on July 1st, 1863, by a round musket ball, which fractured and lodged in the lateral process of the fifth dorsal vertebra. On July 18th, he was admitted from Westchester to the Haddington Hospital, Philadelphia. The wound was painful and discharged freely, and

the patient was much debilitated. The ball was removed through the point of entry after slightly enlarging the wound. The entire right lateral process of the vertebra was removed in four separate pieces, one of which adhered to the flattened ball. Simple dressings were applied, and by November 15th the wound was nearly healed. The patient was unable to bend his body antero-posteriorly; but this disability improved after the application of frictions with volatile liniment. On March 21st, 1864, he was transferred to the Christian Street Hospital, Philadelphia, and on September 21st was sent to Kingston, New York, to be mustered out of service. The case is reported by Acting Assistant Surgeon R. J. Lewis. Pension Examiner R. Loughlan of Kingston, N. Y., reported, on October 3d, 1871, that there is no especial paralysis, but a general physical weakness. The wound occasionally becomes inflamed, opens and discharges. The pulse is regular and respiration free. Disability one-half, and permanent.

Case.—Private Peter Chester, Co. K, 6th Maine Volunteers, aged 22 years, was wounded on November 7th, 1863, by a conoidal ball, which entered over the fourth dorsal vertebra and fracturing its spine passed upward toward the right shoulder, and lodged. There was also a flesh wound of the middle third of the left thigh. He was sent to Washington, and, on November 9th, was admitted into the Stanton Hospital. There was inflammatory fever, with a quick pulse, and the wounds suppurated freely. Simple dressings were applied; anodynes and stimulants were administered, and a full diet was allowed. On November 13th, some pieces of the spine of the vertebra were removed from the wound. By November 19th, the patient was free from pain, and the wound was healing. On January 5th, the ball was extracted from under the edge of the trapezius muscle by counter incision. The patient was returned to duty on April 24th, 1864. He is a pensioner. Pension Examiner T. A. Foster reports, May 18th, 1866, that there is loss of power in arms. His disability is rated total and permanent.

Case.—Private William C. Patrick, Co. E, 104th New York Volunteers, aged 22 years, was wounded at Gettysburg on July 1st, 1863, by a conoidal musket ball, which passed across the lumbar region from right to left, fracturing the spinous and transverse processes of the fourth lumbar vertebra, and lodging in the lumbar muscle. He was admitted to the field hospital, and thence was transferred to Camp Letterman on July 24th. Spiculæ of bone were removed on July 31st; simple dressings were applied to the wound; tonics were administered, and a full diet was allowed. The patient was transferred to a convalescent hospital on September 25th, the wound being entirely healed, and on June 25th, 1864, he was discharged the service. Pension Examiner L. W. Fasquelle reported, January 29th, 1867, that the ball has recently been removed, leaving a large fistulous opening, which still discharges a large amount of pus daily. His disability is total but not permanent.

Case.—Private William Ambrosher, Co. C, 49th Ohio Volunteers, aged 25 years, was wounded on May 27th, 1864, near Dallas, Georgia, by a conoidal musket ball which entered the lumbar region and injured one of the vertebræ. On July 1st, he was admitted to the West End Hospital, Cincinnati. His condition was scorbutic and anæmic, and there were bed-sores over nearly every prominent part of the body that came in contact with the bed. Three days after admission, some necrosed portions of the spinous processes were removed, and two days afterward, the patient had much fever; the parts around the wound became inflamed and swollen, and an abscess formed, the contents of which escaped through a fissure running to the posterior surface of the left thigh. A large sloughing ulcer, four inches in diameter, took the place of the abscess and wound, and sloughing also commenced in the bed-sores. Yeast and charcoal poultices were applied, also oil of turpentine twice daily. The turpentine arrested the sloughing, and, after the fourth application, was discontinued. The subsequent treatment was expectant, and by October the patient was nearly well. He was transferred to the Veteran Reserve Corps on April 4th, 1865. The case is reported by Acting Assistant Surgeon R. Bartholow.

Case.—Private *Benjamin Smith*, Co. K, 12th Alabama Regiment, aged 22 years, was wounded at Gettysburg on July 1st 1863, by a conoidal musket ball, which fractured a process of the third lumbar vertebra. He was sent to the field hospital, and, on August 8th, was admitted to Camp Letterman Hospital. Simple dressings were applied to the wound, and a full diet was allowed. Several pieces of bone were extracted. The patient recovered, and was transferred, for exchange, on September 6th, 1863. Acting Assistant Surgeon W. W. Welch reports that there were no serious symptoms at any time. It was the spinous process that was splintered.

Case.—Private Benjamin Wright, Co. K, 42d Illinois Volunteers, aged 26 years, was wounded at Chickamauga, Georgia, on September 20th, 1863, by a conoidal musket ball, which fractured the fourth lumbar vertebra, injured the spinal cord, and lodged. He was sent to the field hospital, and, on November 23d, was admitted to Brown Hospital at Nashville. Here the ball and a fragment of the spinous process were extracted by Surgeon M. M. Chambers, U. S. V. He was subsequently transferred as follows: February 15th, 1864, to Hospital No. 19, Nashville; March 16th, 1864, to Louisville, Kentucky; April 7th, 1864, to Madison, Indiana; July 24th, 1864, to Quincy, Illinois; September 20th, 1864, to Springfield, Illinois, where he was mustered out of service on September 28th, 1864.

Case.—Private Charles Carlen, Co. I, 3d Pennsylvania Reserves, aged 24 years, was wounded in the back at Bull Run, August 30th, 1862, by a musket ball, which fractured the third lumbar vertebra, and lodged. On August 31st, he was admitted from the field to Ascension Hospital, Washington. Some paralysis of the lower extremities and the bladder followed the injury, but the bowels remained normal. The patient was admitted to the Episcopal Hospital, Philadelphia, on November 12th, 1862, and on December 5th a small piece of bone was removed. Several pieces of bone are reported to have come away at previous times. The patient complained of pain in the back of the neck; the ball remained within the wound. By December 13th, there was no change in the patient's condition. He was discharged the service on February 9th, 1863, and pensioned. His pension was increased on September 4th, 1865. A communication from Pension Examiner T. B. Reed, dated September 16th, 1865, states that the ball has not been extracted. The pensioner suffers from stiffness and neuralgia of the muscles of the back of the neck and head, and from dysuria. His disability is rated three-fourths.

Case.—Private John Stichler, Co. G, 184th Pennsylvania Volunteers, aged 18 years, was wounded at Deep Bottom, Virginia, August 14th, 1864, by a conoidal musket ball, which entered to the right of the last dorsal vertebra, passed inward and downward, and lodged in the right iliac fossa. He was sent to Washington and admitted to Emory Hospital on the 17th. On the 19th, ether and chloroform were administered, and the ball was removed from the right iliac fossa through an incision two inches in length. *A small portion of the right transverse spinal process* and a splinter from the crest of the ilium were also

removed. Adhesive strips were applied to coapt the lips of the wound; tonics, stimulants, and a nutritious diet constituted the remainder of the treatment. This man was returned to duty on December 1st, 1864. The ball was presented to the Army Medical Museum, with the above account, by Acting Assistant Surgeon Jos Walsh, and is No. 4623 of the Surgical Section. Stichler was discharged the service on July 14th, 1865, and on December 12th, 1870, was pensioned. A communication from Pension Examiner G. Harris, dated March 12th, 1872, states that there is a depressed angular cicatrix about one inch square over the original seat of injury; the patient is unable to do any heavy work, but his general health is good. His disability is rated one-half and permanent.

CASE.—Private Peter C. Miller, Co. K, 7th Wisconsin Volunteers, aged 36 years, was wounded at the Wilderness, May 5th, 1864, by a conoidal musket ball, which passed transversely beneath the trapezius, fracturing the spinous process of the seventh cervical vertebra, and escaped at the outer margin of the muscle. He was admitted from the Army of the Potomac to the Douglas Hospital, Washington, on May 11th. Simple dressings were applied to the wound, and pieces of the spinous process were removed. The motion of the cervical region was imperfect and painful. The patient was subsequently transferred to the Satterlee Hospital, Washington, thence on July 9th, 1864, to the Harvey Hospital, Madison, Wisconsin. He was discharged the service on December 17th, 1864. Examining Surgeon D. D. T. Hamlin, of Elkhorn, Wisconsin, reported, on March 12th, 1865, that the "applicant is laboring under necrosis of the two lower cervical vertebræ, producing partial loss of motion of both arms, vertigo, and constant pain in head and shoulders; unable to labor. Disability total and permanent."

CASE.—Private John Quaid, Co. F, 6th Michigan Cavalry, aged 18 years, of sound constitution, was hit in the loins by a conoidal musket ball, in an action near Salem Church, Virginia, May 28th, 1864. He was sent to the hospital of the 1st division, Cavalry Corps, and his wound was examined and dressed by Surgeon W. H. Rulison, 9th New York Cavalry. The ball had entered two inches to the left of the spinous process of the second lumbar vertebra, passed transversely to the right, inclining forward through the lumbar muscles, and emerged five inches from the median line. There was complete paraplegia. The catheter was required for three days, and there was obstinate constipation. On June 2d, the paralysis began to disappear, and the patient was sent to Washington, and entered Stanton Hospital, under the immediate charge of Assistant Surgeon G. A. Mursick, U. S. V. His general condition was good; but there was still partial paraplegia. He complained of pain in the right hip, and the paralysis was most marked on that side. On June 19th, Dr. Mursick removed a small detached fragment of the spinous process of the second lumbar. On July 12th, he removed another fragment. At this date, the patient would move about on crutches; he could move his lower limbs freely in bed; but had difficulty in standing upright. He complained of a queer benumbed sensation in the right hip and thigh. On July 21st, the exit wound was nearly healed; but the entrance wound was sloughy. A permanganate of potassa lotion was prescribed. On July 28th, the wound was granulating finely, and the patient could walk pretty well with the aid of a cane. On August 18th, the wounds had healed, and, with the exception of slight weakness of the lower extremities, he was well. He was furloughed from the hospital at this date, and failing to return, was recorded as a deserter, October 31st, 1864.* His name is not on the Pension List, nor have his heirs made application for pension.

CASE.—Private David Campbell, Co. A, 29th Pennsylvania Volunteers, aged 38 years, was wounded at Gettysburg, Pennsylvania, July 3d, 1863, by a conoidal ball, which entered just above the acromion process and passed deeply into the neck. He was taken prisoner and remained in the enemy's hands until July 17th, when he was admitted to hospital at Annapolis, Maryland. On October 3d, he was transferred to Satterlee Hospital, Philadelphia. Simple dressings were applied. On November 1st, the wound was opened by free incision; the transverse process of the fifth cervical vertebra was found corroded, and was scraped. Some necrosed portions of bone were brought away. He was transferred to Veteran Reserve Corps on December 31st, 1863.

Referring to the figures in Table XX, it will be found that there were twenty-four cases of removal of fragments of the vertebræ after gunshot fracture, with fatal results in only ten instances. The gratification that such a favorable statistical exhibit would otherwise produce, is much diminished by a close examination of the fourteen examples of complete or partial recovery mentioned in the foregoing memoranda. In nine instances the spinous process alone or portions of it only were removed, and that the injuries to the vertebral column could not have been of a very serious nature is shown by seven of the patients having been speedily returned to duty or exchanged. Dr. Lidell (*l. c.* p. 327) has remarked of one of these cases that it afforded "strong evidence of the small amount of danger which usually attends gunshot fractures of the spinous process of a vertebra." The evidence is not weakened by the eight additional cases. In the five cases of recovery in which portions of the laminæ or of the transverse processes were removed, the results were much less satisfactory, and nearly all of the patients still suffer from serious disabilities.

* This is one of the cases cited, under the head of *Concussion of the Spine*, by Surgeon JOHN A. LIDELL, U. S. V., in his admirable paper: *On Injuries of the Spine, including Concussion of the Spinal Cord*, in the *American Journal of Medical Sciences*, for October, 1864, Vol. XLVIII, p. 305.

Of the ten cases of extractions of recent portions or sequestræ of the arches or processes of the vertebræ that terminated fatally, the details furnished are very scanty. The following may serve as examples:

Case.—Private W. B———, 23d Pennsylvania Volunteers, was wounded at Fair Oaks, Virginia, May 31st, 1862, by a round musket ball, which entered the left side below the scapula, and lodged. There was no hæmoptysis, but the patient was very weak, and sensation below the knees was impaired. On June 27th, a probe passed four inches into the wound came in contact with the tenth vertebra, from which a piece of loose bone was removed. Death occurred on July 31st, 1862. The ball was removed from the body of the tenth vertebra at the *post-mortem* examination. The cord was free from compression. The ball was presented to the Army Medical Museum, and is No. 4945 of the Surgical Section. Assistant Surgeon William Thomson, U. S. A., reports the case from Portsmouth Hospital, Virginia, whither the patient had been sent soon after the reception of the wound.

Case.—Private Joseph Pollock, Co. E, 2d Missouri Militia, was admitted to hospital at Kansas City, Missouri, on May 1st, 1863. A ball had fractured the spinous process of the last dorsal vertebra and buried itself in the body of the bone. Complete paralysis ensued. The ball and the spinous process were removed. There was a slight return of sensation after the operation. The patient died on October 19th, 1863. Acting Assistant Surgeon J. Thorpe reports the case but not its fatal issue.

Case.—Private David C. Laird, Co. A, 4th Michigan Volunteers, aged 20 years, was wounded at Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal ball, which entered the lumbar region one inch to the left of the spine, passed downward and forward to the right side, fractured the transverse process of the fourth lumbar vertebra, and emerged near the right ilium. He was treated in the field until July 31st when he entered the hospital at Camp Letterman. When admitted, his general health was good. The discharge from the wounds was profuse. The patient experienced great difficulty in micturition, and the urine was streaked with pus. Tonics, stimulants, and diuretics, with nourishing diet, were administered and cold-water dressings applied to the wound. On August 7th, several spiculæ of bone were removed. A large abscess formed on the 10th, which, being incised, discharged a large quantity of pus. The discharge of pus from the wound increased and the strength of the patient began to fail. Death resulted on September 24th, 1863. The case is reported by Acting Assistant Surgeon W. B. Jones.

Case.—Private W. H. Whitney, Co. K, 7th Maine Volunteers, having received a gunshot fracture of the spine at Cold Harbor, Virginia, June 3d, 1864, was sent to the field hospital of the Sixth Corps. Fragments of bone were removed, and the wound was dressed simply. He died on June 7th, 1864.

Case.—Captain W. H. Shoppee, Co. B, 31st Maine Volunteers, having received a gunshot fracture of the spine at Petersburg, Virginia, on June 26th, was admitted from the field to the Armory Square Hospital, Washington, on July 1st, 1864. The ball and spiculæ of the bone were removed, and the wound was dressed simply. The patient died on July 2d, 1864.

Removal of Balls.—Abstracts of several cases of gunshot fracture of the vertebræ, in which the missiles were extracted during life, either alone or in connection with bone-splinters, have already been cited. (See cases of MacDonald, p. 441; Hogan, p. 442; Flaherty, p. 442; all three examples of recovery after removal of musket balls from the transverse processes of the second lumbar. See also case of Joseph R——, p. 444, for a difficult extraction of a ball from the second lumbar; the cord was injured and fatal tetanus resulted. See also fatal case of Sergeant R——, p. 446, and case of W. C. Patrick, p. 458.) The following is an interesting case, the patient having been under observation for more than seven years after the reception of the injury:

Case.—Private James M. Carter, Co. F, 14th Iowa Volunteers, aged 20 years, was wounded at Yellow Bayou, Louisiana, on May 18th, 1864, by two missiles, one a fragment of shell, the other a ball, both of which entered the back in the dorsal region. On June 2d, he was admitted from Red River to the Jefferson Barracks Hospital, St. Louis. The spinous process of the third dorsal vertebra was fractured. The fragment of shell was removed on May 18th, the ball on June 20th, 1864. The patient was transferred to Keokuk, Iowa, on November 3d, 1864. He was discharged the service on January 28th, 1865, and pensioned. His pension was increased on June 6th, 1866. Pension Examiner A. W. McClure reports, under date of December 27th, 1866, that this man is partially paraplegic. He is able to walk on level ground, but cannot run; sensation in the legs is imperfect; the urine and fæces pass involuntarily. The patient's disability is rated as equal to the loss of a leg, and permanent. His pension was last paid on December 4th, 1871, when his condition was unchanged.

The ten following abstracts are of cases of partial recovery after ball-extractions in spinal injuries. Nearly all the patients are pensioners, suffering from paralysis in various degrees:

Case.—Private Albert C. Williams, Co. I, 53d Ohio, aged 24 years, was wounded at Kenesaw Mountain, Georgia, June 27th, 1864, by a conoidal ball, which entered the right shoulder one inch and a half above the joint, and emerged at the centre of the dorsal vertebræ, fracturing the process. He was at once admitted to the field hospital of the 2d division, Fifteenth Corps, where the ball was extracted and simple dressings applied. He was furloughed on August 18th, 1864. On April 9th, 1865, he

was admitted to the hospital at Gallipolis, Ohio, and discharged on June 25th, 1865. The case is reported by Surgeon Lincoln R. Stone, U. S. V. On June 6th, 1866, Pension Examiner J. P. Bing reports as follows: "Ball entered top of right shoulder fracturing the neck of the scapula, and passing downward and backward, was extracted near the right side of eighth dorsal vertebra. The arm is constantly supported in a sling, and is quite painful and nearly useless."

CASE.—Private Seth Golden, Co. H, 55th Ohio Volunteers, aged 18 years, was wounded at Peach Tree Creek, Georgia, July 20th, 1864. A buckshot struck the shoulder and lodged against the spinal column, injuring the borders of the lower dorsal vertebræ. He was taken to the field hospital. Here the ball was extracted, and he was treated until August 12th, when he was returned to duty. Being unable to march, he was conveyed by ambulance to Savannah, Georgia, and admitted to general hospital, whence he was discharged on May 20th, 1865. In his declaration for pension he states that after reaching home paralysis of the lower extremities gradually came on. Pension Examiner A. H. Agard reports, September 1st, 1870, that necrosis, abscess, and angulation of the spinal column followed, with complete paralysis of the lower extremities, rendering him so helpless as to need the daily attention of an assistant to dress and care for him. This man received a pension of $25 per month. The case is reported by H. W. Sawtelle, M. D.

CASE.—Adjutant James B. Storer, 29th Ohio Volunteers, aged 25 years, received a gunshot fracture of the spinous process of the fifth dorsal vertebra at Buzzard Roost, Georgia, on May 8th, 1864. He was treated in the field hospital until the 12th, when he entered the Officer's Hospital at Nashville. On May 28th, 1864, the ball was extracted The patient was discharged from service on November 30th, 1864. The case is reported by Surgeon J. E. Herbst, U. S. V. On November 24th, 1866, Pension Examiner W. Bowen reported that the pensioner had paralysis of the right lower limb, and partial loss of power of the left, also incontinence of the urine and fæces. His disability is rated total and probably permanent.

CASE.—Private Nelson Tiffany, Co. A, 25th Massachusetts Volunteers, aged 20 years, was wounded at Petersburg, Virginia, May 9th, 1864, by a conoidal ball, which struck the spine near the lower dorsal vertebra, passed into the abdomen, and lodged in front of the right iliac fossa. He was taken to the field hospital, where the ball was cut out, and simple dressings applied. On May 12th, he was transferred to Hampton Hospital, Fort Monroe, and, on June 7th, to Knight Hospital, New Haven, Connecticut, whence he was furloughed on June 17th, 1864. On August 8th, he reported to Mason Hospital, Boston. He was finally discharged from service on May 15th, 1865. Pension Examiner Oramel Martin reports, June, 1865, that the skin adheres firmly to the vertebræ, and that the patient bends his body with pain and difficulty. He is not now a pensioner. Assistant Surgeon E. McClellan, U. S. A., reports the case.

CASE.—Private Patrick Spillane, Co. D, 3d Wisconsin Volunteers, aged 23 years, was wounded at Smithfield, North Carolina, March 16th, 1865, by a conoidal ball, which entered about three inches to the left of the spinal column and two inches above the crest of the ilium, and lodged. He was at once conveyed to the field hospital of the 1st division, Twentieth Corps, where the ball was removed at a point corresponding with the free extremity of the twelfth rib on the right side, and simple dressings were applied. On April 11th, he was transferred to Foster Hospital, New Berne; on April 16th, to DeCamp Hospital, New York Harbor, and, on June 1st, to Swift Hospital, Prairie Du Chien, Wisconsin, whence he was discharged from service on September 1st, 1865. Assistant Surgeon J. W. Brewer, U. S. A., reports the case. Pension Examiner W. A Gordon reports, May 31st, 1866: "Exercise produces slight tremor of the left leg. There is manifest stiffness of the back and weakness across the lumbar region. General health good; disability one-third." The spinous process of the second lumbar was probably fractured.

CASE.—Private C. A. Haywood, Co. E, 114th New York Volunteers, aged 20 years, was wounded at the battle of Winchester, September 19th, 1864, by a conoidal musket ball, which fractured the spinous process of a lumbar vertebra, and lodged in the left iliac region. He was admitted from the field to the hospital of the Nineteenth Corps on September 22d. Simple dressings were applied to the wound, and, on October 8th, the ball was extracted. There was partial paralysis of the left side. The patient was transferred on October 30th, 1864, to Jarvis Hospital, Baltimore, thence, on December 10th, 1864, to Cuyler Hospital, Germantown. He was discharged the service on March 17th, 1865. Pension Examiner A. Willard reported, December 27th, 1865, that the patient has so far recovered as to be able to do light work. Any active, laborious exercise produces pain at the point of injury. Exercise or exertion in a bent position is nearly impossible. The lower limbs are still weak, and easily give way on walking either up or down hill. He rates his disability three-fourths and probably not permanent.

CASE.—Second Lieutenant William A. C. Ryan, Co. G, 132d New York Volunteers, aged 21 years, was wounded at Bachelor's Creek, North Carolina, February 1st, 1864, by a conoidal ball, which fractured the last lumbar vertebra and lodged in the sacrum. He was at once conveyed to the Foster Hospital, New Berne, where simple dressings were applied to the wound. On April 30th, he was transferred to Ladies' Home Hospital, New York City. On June 12th, 1864, the wound discharged very freely, and the patient was in a very good condition, but feeble; an ulcer had formed across the sacrum, about three inches long and about one inch and a half wide, with a sinus leading to the ball. Surgeon Alexander B. Mott, U. S. V., slightly enlarged the sinus, and, with some difficulty, removed the ball, which he found firmly imbedded in the bone. The patient improved after the operation. The treatment consisted of tonics, with a generous diet. The wound healed rapidly, and, on October 9th, 1864, the lieutenant was dismissed the service. There is no record of him at the Pension Office.

CASE.—Private William Heald, Co. K, 3d Maine Volunteers, aged 45 years, was wounded at Gettysburg, July 2d, 1863, by a conoidal ball, which fractured the lumbar vertebræ and left iliac bone of the pelvis, and lodged. Another ball fractured the right wrist-joint, and a third passed through the fleshy portion of the left thigh, posterior to the femur. He was conveyed to the Seminary Hospital, where the ball was extracted from near the lumbar vertebræ, and the fore-arm amputated at the middle third. Simple dressings were applied to the wounds; on August 3d, he was transferred to Camp Letterman Hospital, and on November 14th, to the hospital at York, Pennsylvania, whence he was discharged from service on June 27th, 1864. Pension Examiner Edmund Russel reports, December 4th, 1866, "the wound is still suppurating. Disability total and permanent."

CASE.—Private Samuel F. Sexton, Co. B, 19th Ohio Volunteers, aged 22 years, was wounded at Dallas, Georgia, May 27th, 1864, by a conoidal ball, which entered the back three inches to the left of the spine, crossed the spinal column diagonally, injured the spinous processes of the first and second lumbar vertebræ, and lodged three inches to the right of the spine. He

was taken to the field hospital of the 3d division, Fourth Corps, and simple dressings were applied to the wound. On June 3d, he was transferred to the hospital at Chattanooga; on June 22d, to Hospital No, 19, Nashville; on June 29th, to Jefferson Hospital, Indiana, and on July 25th, to the hospital at Cleveland, Ohio, whence he was discharged from service on June 3d, 1865. Pension Examiner E. Mygatt, reports, May 11th, 1866: "The ball was removed by incision six months after the reception of the injury. There is great loss of substance by sloughing. The region of the wound is tender, and becomes inflamed and painful from any ordinary or continued use of the muscles. Disability one-half, probably not permanent."

FIG. 206.—Round musket ball grooved by impact with bone. *Spec.* 4467, Sect. I, A. M. M.

CASE.—Private Thomas Berry, Co. C, 14th Indiana Volunteers, received a gunshot fracture of the spine at Antietam, Maryland, September 17th, 1862. The ball entered at the lower and outer surface of the crest of the ilium and imbedded itself deeply in the side of the last lumbar vertebra. He was treated on the field until October 6th, when he entered Summit House Hospital, Philadelphia, where the ball was extracted on the same day. On December 12th, 1862, he was returned to duty. The man is not a pensioner. The missile is preserved in the Museum, and is figured in the wood-cut. The case is reported by Acting Assistant Surgeon Winthrop Sargent.

The nine following abstracts relate to fatal cases of extractions of missiles after gunshot fractures of the vertebræ:

CASE.—Private W. Hedden, Co. D, 3d New Jersey Volunteers, aged 32 years, was wounded at Chancellorsville, May 3d, 1863, by a conoidal musket ball, which entered the right side, passed deeply beneath the muscles of the lumbar region and between the first and second lumbar vertebræ, fracturing both, and completely dividing the cord. He was admitted from the field to Stanton Hospital, Washington. There was complete paralysis of the lower extremities, relaxation of the anal sphincter, and retention of urine. The temperature of the body was below the normal standard; the respiration laborious, and the circulation feeble, with a tendency to congestion. The ball was extracted; the patient was placed upon a water-bed, and the urine was drawn off with a catheter. Cold-water dressings were applied to the wound, and tonics, stimulants, etc., were administered. On May 13th, the patient grew worse. He complained of pain in the track of the ball, fever and great restlessness. The wound did not discharge feely, and the urine dribbled away. On May 15th, there was an augmentation of the above symptoms, with low muttering delirium. By May 17th, the delirium increased, with a tendency to convulsions, and the patient died. The case is reported by Assistant Surgeon P. C. Davis, U. S. A.

CASE.—Private John H. Dowling, Co. E, 2d Colorado Cavalry, was wounded at Camp Babbitt, Colorado, December 27th, 1863, by a ball from a revolver in the hands of a fellow soldier. The missile entered the right side of the neck, low down, rather in front of the median line, grazed the vertebræ, and lodged in the other side, nearly opposite the point of entrance. An hour or two after the reception of the injury he was admitted to the Post Hospital, complaining of paralysis of the extremities; the ball was removed. The paralysis increased in intensity until death, which occurred on December 29th, 1863.

CASE.—Corporal Frederick Ruhling, Co. I, 56th Massachusetts Volunteers, aged 40 years, received a gunshot wound of the left shoulder, with injury to the spine by a ball from a grapeshot, at North Anna River, May 24th, 1864. He was taken to the field hospital of the 1st division, Ninth Corps, where the ball was extracted and simple dressings applied to the wound. He died on May 24th, 1864. The case is reported by Surgeon M. K. Hogan, U. S. V.

CASE.—Private *Samuel Jessup,* Co. C, 4th Georgia Regiment, received a gunshot wound of the back and shoulder by a conoidal ball at Petersburg, Virginia, March 25th, 1865; the vertebral column was fractured. He was taken to the field hospital of the 2d division, Ninth Corps, where the ball was extracted. On the 27th, he was sent to the general field hospital of the Ninth Corps, and, on April 9th, was put on board the steamer State of Maine, to be transferred to Washington. He died on the next day. Acting Assistant Surgeon W. H. Finn reported the case.

CASE.—Private John Fisher, Co E, 2d Missouri Militia, was shot in the back at Independence, Missouri, on August 11th, 1862. He was sent to Kansas City, and admitted to hospital on August 23d. The ball was extracted from the first lumbar vertebra. The patient recovered from the operation, but sank into a typhoid condition, and died on September 6th, 1862. There were immense bed-sores on the back and hips.

CASE.—Private L. T. Jewett, Co. A, 1st Maine Heavy Artillery, aged 23 years, was wounded at Spottsylvania, Virginia, May 18th, 1864. The missile entered the left side, near the first lumbar vertebra, and emerged on the opposite side, near the angle of the eleventh rib. He was treated in the field, and, on May 22d, was admitted to Emory Hospital, Washington, D. C. On admission, there was palsy of the lower extremities, retention of urine, and peritonitis. The ball was extracted, water dressings were applied to the wound, and the urine was drawn off by the catheter. Death resulted on May 25th, 1864.

CASE.—Captain Charles Harris, Co. H, 7th Michigan Volunteers, received a penetrating wound of the spinal column by a conoidal ball at Spottsylvania, Virginia, May 12th, 1864. The ball lodged. He was conveyed to the hospital of the 2d division, Second Corps, where the ball was extracted from the spinal column and cold-water dressings applied. He was afterward treated in private quarters in Washington, and was furloughed on May 27th, 1864. The Adjutant General states that he died on November 4th, 1864. The case is reported by Surgeon J. F. Dyer.

CASE.—Private Eugene R. Buckman, Co. C, 8th Pennsylvania Cavalry, aged 19 years, received a gunshot wound of the back, at the junction of the dorsal and lumbar regions, by a conoidal ball at Jettersville, Virginia, April 5th, 1865; the ball lodged. He was conveyed to the field hospital of the Cavalry Corps, where the ball was extracted and simple dressings applied to the wound. On April 15th, he entered the 1st division hospital, Annapolis. There was complete paralysis of the lower extremities, and extensive bed-sores over both trochanters, which sloughed so far as to expose the femurs for near their entire upper third, especially the right one. Dry oakum dressings were applied and charcoal poultices to the bed-sores; anodynes were given. His appetite was very poor, and he could retain no solid food. The wound improved until about the 20th, when it commenced sloughing. Death resulted on April 25th, 1865. Acting Assistant Surgeon William Pitt Willis reports the case.

CASE.—Private Arthur Kay, Co. F, 62d Pennsylvania Volunteers, was wounded at Fredericksburg, Virginia, December 13th, 1862, by a grapeshot, which entered the back at the left shoulder and lodged in the left hip. He was taken to the field hospital of the 1st division, Fifth Corps, where the ball was removed and water dressings applied to the wound Death resulted on December 19th, 1862. Assistant Surgeon A. J. Hobart, 1st Michigan Volunteers, reports the case.

The question of the propriety of trephining the spine, or more properly speaking, of excising portions of the vertebræ, was discussed by Paré, Heister, and many of the older authors, and, with great acerbity, early in this century, when Henry Cline[1] first performed the operation at St. Thomas's Hospital, June 16th, 1814, in the case of a man of 26 years, who had fractured the spinous processes of the seventh eighth, and ninth vertebræ, by a fall from a second story on the previous day. The arches of the upper two vertebræ were crushed in upon the cord, and were removed by aid of a trephine, Machell's circular saw, chisel and mallet. The patient lived seventeen days, and Mr. Cline candidly admitted that the operation hastened his end. Tyrrell[2] twice repeated the operation, in 1822, and in 1827, with unfavorable results, and mentions that Wickham, of Winchester, and Attenburrow, of Nottingham, had anticipated him, with no better fortune. No particulars are given of Attenburrow's case, and it may be identical with that of Oldknow,[3] of Nottingham (1819). The operation was first undertaken in this country by John Rhea Barton[4] (1824) and was repeated by Dr. A. G. Smith[5] in 1829, and by Dr. D. L. Rogers[6] in 1834. In Germany, Holscher[7] in 1828, was as unsuccessful; as was Mayer,[8] in 1846. In France, Laugier[9] operated unsuccessfully in 1840. Meanwhile, in Great Britain, the operation was occasionally advocated and performed. South[10] had a fatal case, and Edwards[11] of New South Wales, claimed a success, but the ultimate result is not given. Ballingal[12] relates that Dr Blair, formerly a surgeon in the Royal Navy, had performed according to Dr. Monro, *secundus*, this operation successfully on a seaman; but adds that "very few cases occur in which the operation of trepanning the spine ought to be performed." The operation has, of later years, been resorted to in this country, twice by G. C. Blackman,[13] thrice by Dr. H. A. Potter,[14] of Ontario County, New York, also by Dr. Stephen Smith,[15] Dr. J. C. Hutchison[16] and Dr. Goldsmith,[17] and abroad by Dr. G. M. Jones,[18] Dr. R. McDonnell,[19] Dr. H. J. Tyrrell, Dr. Gordon, and M. Tillaux,[20] M. Félizet,[21] Mr. Maunder,[22] and Mr. Willett.[23]

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1 See *New England Journal of Medicine and Surgery*, Vol. IV, No. 1, Jan. 1815; also a full account in SOUTH, *Notes to Chelius*. Am. ed. 1847, p. 590, and nearly all works on resection.

2 Notes to *Lectures of Sir Astley Cooper*, London, 1829, Vol. II, p. 11 (case of Buckley, at St. Thomas's), and *London Lancet*, Vol. XI, p. 685 (case of Mahony, arch and spinous process of twelfth dorsal removed).

3 See Bransby Cooper's edition of Sir Astley Cooper's *Treatise on Dislocations and Fractures*, London, 1842, Vol. VIII, p. 560.

4 Godman's edition of *A. Cooper on Fractures*.

5 *North Am. Med. and Surg. Jour.*, Vol. VIII, p. 94, 1829.

6 *Am. Jour. of Med. Sci.*, O. S., 1835, Vol. XVI, p. 91.

7 *Hannoversche Annalen f. d. ges. Heilkunde*, B. IV, 1839, S. 330.

8 V. WALTHER und V. AMMON'S *Journal der Chirurgie*, Bd. XXXVIII, 1848, S. 178.

9 *Bulletin Chirurgical*, T. I, p. 401, and *Des Lésions traumatiques de la Moelle épinière*. Thèse de Concours, 1848, p. 133, Obs. 52.

10 *Notes to Chelius*, Vol. I, p. 540, Eng. ed.

11 *British and Foreign Med. Rev.*, Vol. VI, 1838, p. 162.

12 *Outlines of Military Surgery*, 5th ed. 1855, p. 321.

13 Ed. of Mott's Translation of *Velpeau's Operative Surgery*, Vol. II, p. 392, and *Am. Med. Times*, July 13, 1861, p. 21.

14 HURD, in *New York Journal of Medicine*, Vol. IV, March, 1845; and POTTER, *Am. Med. Times*, 1863.

15 *New York Journal of Medicine*, Vol. VI, p. 87.

16 *Transactions of New York State Medical Society*, 1861.

17 GROSS, S. D. (*Op. cit.*, Vol. I, 2d ed.), according to Dr. Ashhurst. I cannot find the reference in the 3d or 4th eds., and have not access to the 2d, at this moment.

18 *London Medical Times and Gazette*, 1856, Vol. II, p. 86.

19 *Dublin Quarterly Journal*, Aug. 1865, and Aug. 1866, Vols. 51 and 53. In the latter of these excellent articles by Dr. McDonnell, the cases Drs. Tyrrell and Gordon are recorded.

20 *Bulletin général de Thérapeutique*, Mars 15, 1866.

21 *Archives générales de Méd.*, VI^me^ serie, T. VI, pp 439, 572, 683.

22 *London Medical Times and Gazette*, 1867, Vol. I, p. 195.

23 *London Medical Times and Gazette*, 1867, Vol. I, p. 129.

The subject of the so-called trepannation of the spine has latterly attracted much attention, mainly through the strenuous advocacy of the operation, on physiological grounds, by Dr. Brown-Séquard;[1] the publication in the *Archives générales* by Mr. Félizet, of three extended papers, and the reports of the discussions in the British medical societies on the partially successful operation by Dr. Gordon, the pamphlets published by Dr. McDonnell, Mr. Nunnelly's[2] address, and Dr. Ashhurst's monograph.[3]

After Cline's unsuccessful case, Sir Astley Cooper assured his class that it would be unmanly to refuse the operation, and undertook it himself, found his diagnosis wrong, after the incision was made, the spinous process only being involved, and did not conclude the operation.[4]

Mr. Solly[5] remembers that Travers, who was present at Tyrrell's first operation, in 1822, expressed the opinion that the operation never would succeed; and it is noticeable that, in his second case, Tyrrell consulted with his other colleague, Green. No improvement followed the operation; the patient survived eight days.

The cases of Wickham, Attenburrow,[6] Oldknow, Barton, Rogers, Holscher, Mayer, Laugier, South, Blackman, S. Smith, Hutchison, Jones, McDonnell, Tyrrell, Willett, Maunder, and two of H. A Potter terminated fatally. The advocates of the operation will hardly rest their argument on Monro's vague recollection of Blair's case, or on Goldsmith's case, in which "no particular benefit" was obtained, or on that of Edwards, in which the "patient did well" for a time, but no result is given, or in the third case of Dr. H. A. Potter, with no improvement after the operation, or in Dr. A. G. Smith's case, which Dr. Brown-Séquard defends against Malgaigne's telling criticism, and in which the operator saw the patient for the last time a week after: "since then, I have not seen him, but I entertain considerable hopes." (*Op. cit.* p. 96) But those who favor the operation, may justly claim that the partial recovery of Dr. Gordon's case was due to it, and that in many of the fatal cases, temporary alleviation of distressing symptoms was obtained.[7] The operation has not found favor with military surgeons. Surgeon J. A Lidell (*l. c.*, p. 320), "after considerable investigation * * has failed to find one completely successful case on record" Legouest[8] discountenances the operation, and thinks it wiser not to interfere with gunshot fractures of the spinous processes even, unless the fragments are detached and large. Jobert[9] is unmeasured in his condemnation, characterizing the operation as "*barbare et ridicule.*" Dr. E. Gurlt[10] replies *seriatim* to Dr. Brown-Séquard's arguments, and to that derived from experiments on animals,—from which Professor Brown-Séquard pronounces it "quite evident that the laying bare of the spinal cord is not a dangerous operation," but few animals dying,—Dr. Gurlt opposes the experience of Dr. Bernhard Heine,[11] who resected vertebræ of twenty-four cats and twelve dogs.

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[1] BROWN-SÉQUARD, Course of Lectures on the Physiology and Pathology of the Central Nervous System, Phila., 1860, Appendix, p. 244.

[2] NUNNELLY, *Address in Surgery at the Thirty-seventh Meeting of the British Medical Association.* Held in Leeds, July, 1869.

[3] ASHHURST, *Injuries of the Spine, with an Analysis of nearly Four Hundred Cases,* Phila., 1867. A carefully written work, to which I have had frequent occasion to refer in compiling this chapter.

[4] SOUTH'S *Notes to Chelius*, Vol. I.

[5] *Medical Times and Gazette*, 1865, Vol. II, p. 639.

[6] O. HEYFELDER. *Lehrbuch der Resectionen*, Wien, 1863, S. 313, says that this was a fatal case. I cannot trace the source of his information.

[7] I have not included the case of Dr. John B. Walker (*Catalogue of the Anatomical Museum of the Boston Society for Medical Improvement.* By J. B. S. JACKSON, M. D., Boston, 1847, p. 31), in which the spinous process of the sixth cervical vertebra, "quite loose though not driven in," was twisted off.

[8] *Chirurgie d'Armée*, pp. 341, 352.

[9] *Plaies d'Armes à feu*, Paris, 1833. p. 125.

[10] *Handbuch der Lehre von den Knochenbrüchen*, Hamm, 1864, p. 186.

[11] WAGNER, A., *Über den Heilungsprocess nach Resection und Extirpation der Knochen.* Berlin, 1853, S. 45.

All of the cats died and only two dogs survived. The result in the case of a calf was also fatal. Malgaigne calls the operation a "desperate and blind one."[1]

The successful instances that have been adduced in this chapter of removal of fragments of vertebræ after gunshot fracture nearly all resemble the operation of Louis,[2] in 1762, sometimes cited as the first example of resection of the spine, but in reality an extraction of loose fragments, some of them, it is true, "*assez considérables.*" Such operations are perfectly rational, and have resulted, as has been shown, in a fair measure of success. It may be permissible to go a step farther, and to excise with bone-forceps or gouge any sharp projecting points of the broken arches; but it is questionable if the danger of wounding the membranes does not counterbalance the advantages to be derived from this procedure. Formal trephining of the spine has hitherto given such unfortunate results, that without much more positive favorable evidence, it cannot be accepted as an established operation.

Of *Concussion* and *Commotion* of the spinal cord very little is said in the reports, though these accidents are noted in many of the cases briefly cited in the first section of this chapter.[3] Dr. John A. Lidell, in the excellent memoir already referred to, relates the histories of several cases that came under his observation during the war, and discusses the subject fully. He found the use of dry cups very advantageous. Dr. Chisholm,[4] who has epitomized the theory and practice on *gunshot wounds of the spine*, generally accepted by the Confederate military surgeons, treats of concussion of the spinal cord, and of myelitis and intravertebral extravasation as its occasional consequences. He speaks of the explosion of a shell in the immediate vicinity of the back as a not infrequent cause of such results! He recommends extract of belladonna, in half-grain doses, in congestions of the spinal cord, and advises the internal use of strychnia to hasten convalescence from paraplegia. In gunshot fractures of the vertebral column, accompanied by lesions of the cord, his prognosis is gloomy: "the patient dies, no course of treatment offering any prospect of success." Another Confederate surgeon, Dr. P. F. Eve,[5] in a paper read before the Tennessee Medical Society, is of a different opinion, and cites two cases of balls lodged in the vertebral column, in which the patients survived for a long time.

Luxations of the Vertebræ will be considered in a separate chapter on simple fractures and luxations.[6]

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[1] PACKARD, Translation of Malgaigne's *Treatise on Fractures*, Phila., 1859, p. 345.

[2] LOUIS, *Rémarques et Observations sur les Fractures et la Luxation des Vertebres.* Mém. Posth. *Arch. Gén. de Méd.*, 1836, T. XI, 2e Série, p. 417. Captain Villedon received a gunshot fracture of a dorsal vertebra, Nov. 20th, 1762, and fell completely paraplegic. M. Duplessis, his regimental surgeon, made free incisions and extracted the ball. Louis saw the patient on the fourth day, and passing his finger to the bottom of the wound found splinters and some rather large fragments of bone. Louis drew a parallel between the case and a depressed fracture of the cranium. Duplessis was convinced, and the next day the fragments were removed. The paralysis gradually subsided, and twelve years afterwards Captain Villedon was living on his estate in Poitou, in good health, walking with the aid of a cane, though his limbs were feeble and shrunken.

[3] Consult Mr. Shaw's able paper (*op. cit.*, p. 370); Mr. Erichsen, *On Railway and other Injuries of the Nervous System;* Dr. Buzzard, *On Cases of Injury from Railway Accidents*, Lancet, 1867, p. 389; Dr. Bastian (*Med. Chir. Trans.*, Vol. I, p. 499), and the systematic writers on surgery.

[4] *Op. cit.*, p. 333. [5] *Amer. Jour. Med. Sci.*, N. S., Vol. LVI, p. 103.

[6] On the subjects considered in this chapter, consult farther: BLASIUS, E., *Die traumatischen Wirbelverrenkungen;* BELL, C., *On Injuries of the Spine and Thigh-bone*, London, 4to, 1824; BERTHEAU, R., *Über einige Fälle von Verletzungen der Halswirbelsäule*, Diss. Göttingen, 1869; BOYER, *Traité des Maladies Chirurgieales*, 5 éd., Paris, 1846, T. III, p. 132; BRERA, *Della Rachialgite Cenni Pathologiei*, Livonia, 1810, 4to, pp. 30; BRODIE, *Med. Chir. Trans.*, Vol. XX, 1837, p. 118, and *Works* collected by C. HAWKINS, London, 1865, Vol. II, p. 319, and Vol. III, p. 85; BECK, *Kriegs-Chirurgische Erfahrungen während des Feldzuges* 1866, *in Süddeutshland*, Freiburg, 1867, p. 195; CASPER, J. L., *Über die Verletzungen des Rückenmarks in Hinsicht auf ihr Lethalitäts-Verhältniss*, Berlin, 1823; CUËNOTTE, F. A. F., *Dissert. sistens casum subluxationis vertebræ dorsi cum fractura complicatæ post factam repositionem*, etc., Argent. 1761; ERICHSEN, *Science and Art of Surgery*, London, 1869, Vol. I, p. 411; FISHER, *Militär-ärztliche Skizzen aus Süddeutschland und Böhmen*, Aarau, 1867, p. 64; FALLOPIUS, *Opera genuina omnia*, Venet. 1606, T. II, p. 379; GRAY, *Amer. Jour. Med. Sci.*, Vol. LII, p. 109, and *Circular No.* 3, *S. G. O.*, 1871, p. 139; HÆFNER, *Dissertatio de medullæ spinalis inflammatione*, Marbourg, 1792; HEISTER, *Institutiones Chirurgieæ*, Amstelodami, 4to, 1739, T. I, p. 199; HÉVIN, *Cours de Pathologie et de Thérapeutique Chirurgicales*, Paris, 1785, T. II, p. 390; HILTON, *Guy's Hospital Reports*, 3d ser. Vol. II; LOHMEYER, *Die Schusswunden und ihre Behandlung*, Göttingen, 1859, p. 112; LE GROS CLARK, F., *Lectures on the Principles of Surgical Diagnosis*, London, 1870, p. 187; MORGAGNI, *De sed. et causis morb.*, ed. Patav., 1765, T. I, p. 273; MCCORMACK, W., *On a case of Injury of the Spine in the Cervical Region*, Dublin, 1867; RAUCH, J. F. L., *De vertebrarum cervicalium luxatione*, Berolini, 1828; STROMEYER, *Maximen der Kriegsheilkunst*, Hannover, 1861, p. 473.

CHAPTER V.

WOUNDS AND INJURIES OF THE CHEST.

The number of cases reported of wounds and injuries of the chest is large, and the aggregate would appear still greater, had not the wounds of the soft tissues covering the chest posteriorly been classified with the wounds of the back. The punctured, incised, and miscellaneous wounds and injuries will first be briefly noticed,—the simple fractures and other of the more important of the miscellaneous group being discussed elsewhere;—the second section will be devoted to gunshot wounds of the thorax and its contents, and the third to the operations required by the effects of injuries of this division of the body.

Section I.

INCISED WOUNDS, CONTUSIONS, AND MISCELLANEOUS INJURIES.

Excluding gunshot contusions of the walls of the chest, burns and scalds, and simple fractures of the clavicle, scapula, ribs, and sternum, the returns of this Office exhibit only two hundred and ninety cases of injuries of this group. Of these nine were sabre wounds, and twenty-nine bayonet wounds.

Sabre Wounds.—Only one of the nine cases that came under treatment, proved fatal; although several were examples of penetrating wounds of the chest:

Case.—Private Leander Clark, Co. G. 123d Indiana Volunteers, aged 40 years, a recent recruit, two days before the action of Rocky Face Ridge, was accidentally wounded in the right chest by a sabre. The extent of the injury is not noted. He was admitted on May 9th, 1864, to Clay Hospital, Louisville, Kentucky. He was here treated for severe bronchitis until June 25th, when he was transferred to the hospital at Jeffersonville, Indiana, and registered as ill of chronic bronchitis. Subsequently Surgeon H. P. Stearns, U. S. V., diagnosticated phthisis, and the patient is recorded as having died on August 11th, 1864, of *phthisis pulmonalis*. The sabre wound could hardly have been regarded as an exciting cause of the tubercular affection, as it is not mentioned in the later reports.

Case.—Private James McCauley, Co. C, 1st United States Cavalry, aged 21 years, received a sabre thrust of the chest at Upperville, Virginia, June 21st, 1863. The point entered about two inches above and to the inner edge of the inferior angle of the right scapula, passed directly through the upper lobe of the right lung from behind forward, and made its appearance beneath the integument two inches above the right nipple, producing a discoloration at that point. He also received four sabre cuts of the head, one of which, over the right parietal bone, fractured the skull; the others were scalp wounds. He was treated in the field, and, on the 24th, was sent to Emory Hospital, Washington. On admission, he complained of very slight dyspnœa and some constipation, which was obviated by a potion of castor oil. Pulse 84; tongue clean; appetite good. A bandage was placed around the chest and cold-water dressings applied. A fragment of bone was removed from the right parietal bone. He

was furloughed on July 17th, and returned to duty to Carlisle Barracks, September 11th, 1863. Pension Examiner J. O. Stanton reports, under date of August 3d, 1871: "The pensioner states that he frequently has hæmorrhage from the lungs. There seems to be considerable irritability of the throat and fauces. He is strong and muscular; circulation good."

CASE.—Private Joseph Dangel, Co. B, 9th New York Cavalry, aged 21 years, received a perforating sabre wound of the chest at Upperville, Virginia, June 21st, 1863. The weapon entered between the ninth and tenth ribs, left side, beneath the axilla, passed inward and backward through the lung and pleural cavity, and emerged two inches below the inferior angle of the left scapula. He also received a gunshot compound fracture of the vertex of the skull, a penetrating wound of the abdomen, a wound on the dorsal aspect of the left foot, a wound of the right hand, carrying away the little finger, and a wound of the back. He was taken prisoner and conveyed to Andersonville, where he remained a period of seventeen months. He was finally paroled and sent to Baltimore, entering Jarvis Hospital on April 5th, 1865. On May 29th, 1865, he was discharged from service, at which time Assistant Surgeon DeWitt C. Peters, U. S. A., who reports the case, states that he had entirely recovered, with the exception of some pleuritic adhesions and contractions of the left side, which, to a great extent, disabled him. He is not a pensioner.

CASE.—Private Robert McReery, Co. F, 1st Michigan Cavalry, aged 33 years, was wounded at Gettysburg, Pennsylvania, July 3d, 1863, by a sabre, which entered the posterior boundary of the left axilla, and passed upward some four inches through the serratus magnus and pectoralis muscles. He was conveyed to the field hospital, where he remained until August 20th, when he was transferred to the hospital at Camp Letterman. When admitted, his general health was feeble, and the wound discharged ichorous pus. An emollient poultice was applied, and the discharge soon assumed a healthy appearance. Under the administration of nouishing diet and stimulants, his general health improved slowly. An abscess formed on September 5th, which was opened. The patient was transferred, on October 9th, to the Cotton Factory Hospital, Harrisburg, Pennsylvania, and discharged from service on January 6th, 1864, at which time he suffered from phthisis pulmonalis. He is a pensioner.

CASE.—Private William Cherry, Co C, 2d New York Cavalry, aged 25 years, was wounded at Claiborne, Alabama, April 11th, 1865, by a sabre, which entered the body at a point five inches below the nipple, in a line perpendicular to it. On April 25th, he was admitted to the Marine Hospital, New Orleans, and, on the 29th, was transferred to New York; in the hospitals of which State he remained until finally discharged from service. He is not a pensioner.

NICKNEY, ANTON, Private, Co. B, 12th Illinois Volunteers. Severe sword wound of right axilla. Culpeper, Virginia, October, 1863. Treated in hospital at Quincy, Illinois. Simple dressings. Discharged on April 18th, 1864. Loss of power in arm. Not a pensioner.

EARLES, JAMES, Corporal, Co. G, 61st New York Volunteers, aged 44 years. Sabre cut over sternum. May 11th, 1864. Treated in Stanton Hospital, Washington. Returned to duty on June 17th, 1864. Not a pensioner.

BRITSCH, CHRISTIAN, Private, Co. B, 82d Pennsylvania Volunteers, aged 50 years. Sabre wound of left side. Treated in hospital at Chester, Pennsylvania. Returned to duty. Not a pensioner.

CLARK, GAVIN, Private, Co. I, 1st Illinois Artillery, aged 27 years. Sabre wound right side. Treated in Clay Hospital, Louisville, Kentucky. Returned to duty. Not a pensioner.

BAYONET WOUNDS.—There were twenty-nine cases of this group reported. Nine proved fatal, six were discharged, twelve were returned to duty, and in two cases the results could not be ascertained. If there was no error in diagnosis, the abstracts of the two following cases furnish examples of punctured wounds of both lungs, when life was prolonged for two days after the reception of the injury:

CASE.—Private Nicholas Schenecker, Co. E, 35th Massachusetts Volunteers, aged 25 years, was wounded at Petersburg, Virginia, September 30th, 1864, by a bayonet, which entered the left side, between the second and third ribs, penetrated the lungs, and emerged anteriorly near the sternum. He was treated in the field, and, on October 5th, was transferred to Finley Hospital, Washington. Simple dressings were applied to the wound. Death occurred on October 7th, 1864. The case is reported by Surgeon G. L. Pancoast, U. S. V.

RAY, WILLIAM, Private, Co. E, 1st Washington Territory Volunteers. Perforating bayonet wound of both lungs. December 3d, 1865. The weapon entered anteriorly to the lower portion of the left lung, penetrating the diaphragm, passing upward and backward, making its exit through the right lung posteriorly. Died, December 5th, 1865. The case is reported by Assistant Surgeon Clinton Wagner, U. S. A.

In the four following cases, bayonet stabs in the chest were followed by fatal inflammation of the lung:

Phillips, Crawford, Private, Co. A, 44th Georgia. Bayonet wound of right chest and arm, and gunshot wound of neck. Wilderness, Virginia, May 9th, 1864. He was admitted to Douglas Hospital, Washington; transferred to Lincoln Hospital, May 14th, and died on May 29th, 1864.

CROMNEY, OWEN, Private, Co. K, 2d Connecticut Volunteers, aged 19 years. Bayonet entered above outer third of left clavicle and passed downward. Cold Harbor, June 3d, 1864. Treated in 3d division hospital, Alexandria. Lung affected, cough, and slight expectoration. Died on July 29th, 1864. The case is reported by Surgeon Edwin Bentley, U. S. V.

FRAZER, EDWARD, Private, Co. G, 64th United States Colored Troops. Bayonet wound in right side; the weapon entered the pleural cavity one inch below the mamma. May 28th, 1864. Treated in hospital at Natchez, Mississippi. Died on June 2d, 1864, of inflammation of the pleura extending to the lung. The case is reported by Assistant Surgeon W. H. Miles, 63d U. S. C. T.

DELANY, MICHAEL, Color Sergeant, 27th Illinois, was wounded at Marietta, Georgia, June 14th, 1864, by a conoidal ball, which fractured the right arm and jaw. He also received a bayonet penetrating wound of the chest. He was sent to Ackworth, Georgia, on June 28th, and thence to Chattanooga on June 30th. He died on July 11th, 1864. Surgeon Francis Salter, U. S. V., reports the case.

In the three succeeding fatal cases, death resulted promptly from lesions of the large vessels of the thorax:

JEFFORDS, HARRISON H., Colonel, 4th Michigan Volunteers. Bayonet thrust through chest. Gettysburg, Pennsylvania, July 3d, 1863. Died on July 3d, 1863.

MITCHELL, LOUIS F., 1st Minnesota. Two bayonet wounds through chest. Edward's Ferry, October 21st, 1861. Died on the same day. The case is reported by Surgeon D. W. Hand, U. S. V.

CASE.—Private *B. H*———, Co. A, Cobb's Georgia Legion, a prisoner of war at Newport News, Virginia, received a penetrating bayonet wound of the chest, May 7th, 1865. Acting Assistant Surgeon William H. Helm, who reports the case, states: "At half past ten o'clock P. M., May 7th, I was sent for to see a prisoner who had been wounded by a sentinel. I found him lying on his left side, with his knees drawn pretty well up, and his body bent forward. He complained considerably of pain in any position and begged for some morphia. On examination, I found a triangular-shaped opening on the posterior portion of the thorax, two inches below the inferior angle of the scapula and four inches to the right of the spine. On examination with the probe, I found that the probe ran down beneath the skin for two or three inches, but was unable to detect any opening into the thorax. Pulse good but slightly accelerated. Respiration very little if at all affected. Expression of countenance slightly uneasy. There was a very slight oozing from the wound. After a consultation, it was concluded that it was a non-penetrating wound of the chest. The wound was covered by a piece of dry lint fastened by adhesive plaster. A grain of morphia was given him, with directions to give him half a grain in an hour if he was not relieved. Toward morning he became delirious and died about sunrise, without the ward-master having sent for any of the surgeons. Necropsy: On tracing the path of the bayonet it was found to have gone downward and to the left, some two inches beneath the skin, when it entered the ninth intercostal space. Upon opening the thorax nearly its entire cavity was found filled with clots and semi-fluid blood, of a dark-red hue. The opening in the ninth intercostal space was found and the further course of the bayonet was traced, where it had torn through the muscles to the outer and right edge of the intervertebral disk, between the ninth and tenth dorsal vertebræ. The lungs were found to be uninjured. The pericardium contained a clot of bright-red hue, about the size of a large hen's egg, and several ounces of bloody serum. A small triangular spot was seen on the posterior portion of the base of the left ventricle. The probe sank into the triangular spot by its own weight merely, and, on opening the left ventricle, it was found to be a penetrating wound of the heart. The opposite surface of the ventricle was entirely uninjured. The vena cava ascendens was probably pierced by the bayonet, though it was impossible to find the opening, owing to the dense fibrous clots surrounding the vessels, and pervading the cellular tissue. This supposition accounts for the large venous hæmorrhage and is entirely probable, as the vena cava ascendens was in the course of the bayonet."

Of the six men discharged for disability on account of bayonet wounds of the chest, only one is a pensioner. The other five had wounds that probably seriously implicated the external soft parts only:

CASE.—Corporal Thomas Powers, Co. G, 2d United States Infantry, aged 40 years, was stabbed by a bayonet in the hands of a refractory prisoner on December 2d, 1862. The bayonet entered one-half inch to the right of the median line of the chest, immediately next to the middle of the xiphoid cartilage, penetrated four inches in a direction downward and outward, entering the chest over the costal cartilages of the eighth, ninth, and tenth ribs. On receipt of the injury there was prostration, vomiting for two days, difficulty of breathing, incapacity to draw a long breath, total absence of movement of ribs of lower part of right chest, and decubitus on injured side; no respiration heard on lower part of right chest; puerile respiration above and over the whole of the left chest, mixed, however, in some parts of the left chest, with mucous sounds of bronchitis. Gentle stimulants and essence of beef were given. On December 5th, the vomiting had ceased. He was transferred to Stanton Hospital, Washington, on December 11th; at that time, the wound was closed and the orifice of it covered over by a small, dark-colored, triangular-shaped scab. He complained much of darting pains and stitches in the right side. He exhibited dyspnœa and increased frequency of the respiratory movements. At times, the dyspnœa was so great as to compel him to sit up in bed. There was a moderate amount of effusion in cavity of right pleura, with friction sounds higher up on the same side. He was directed to keep quiet in bed, to be supported by a nourishing diet, to take fluid extract of cinchona, combined with iodide of potassium, and, with a view to still further promote absorption and combat the traumatic pleurisy, to have a succession of blisters applied to his right chest. About Christmas, he had a severe exacerbation of all his symptoms, which was combated by the application of wet and dry cups. A fresh pleurisy was lighted up in the early part of January, 1863, which was treated in the same way. Under the tonic and supporting plan of treatment, he mended slowly in spite of the relapses, and by January 25th, was able to sit up most of the time. He was discharged from service, at his own request, on February 2d, 1863. He was still very feeble and wan, had dyspnœa, and percussion showed that the pleuritic effusion, although diminished in quantity, still remained, but the dyspnœa appeared to be much greater than could be accounted for satisfactorily by the amount of the effusion. Examining

Surgeon Frank S. Porter reports, October 30th, 1867: The bayonet entered the chest on the median line, at the lower end of the sternum, and, ranging downward and backward, wounded the diaphragm and liver. The result is enlargement of the left lobe of the liver, severe cough, bloody purulent expectoration, hæmorrhage of the bowels, with great emaciation. Disability total.

COSGROVE, JESSE D., 1st Maryland. Bayonet wound of chest. Gettysburg, July, 1863. Discharged from service. Not a pensioner.

EDDIE, SAMUEL E., Private, Co. D, 37th Massachusetts Volunteers, aged 42 years. Perforating bayonet wound of chest. Treated in Harewood Hospital, Washington. Discharged from service on June 12th, 1865. Not a pensioner.

HANLY, TIMOTHY, Private, Co. E, 52d New York Volunteers, aged 35 years. Perforating bayonet wound of chest. White Oak Swamp, Virginia, June 30th, 1862. Treated in Frederick and Philadelphia hospitals. Bloody expectoration for two weeks. Discharged from service on September 27th, 1862. Not a pensioner.

KIRKER, IRA, Private, Co. F, 140th Pennsylvania Volunteers, aged 21 years. Bayonet wound of right breast. Spottsylvania, Virginia, May 12th, 1864. Treated in Harewood Hospital, Washington. Discharged from service. Not a pensioner.

MOHAWK, S., Corporal, Co. C, 7th Maine, aged 28 years. Bayonet wound of left breast. Wilderness, Virginia, May 6th, 1864. Treated in Emory and Lincoln Hospitals, Washington. Discharged from service. Not a pensioner.

The termination of the two following Confederate cases could not be traced; but it may be hoped, from the condition of the patients when last reported, that they could ultimately have been counted in the list of recoveries:

CASE.—Private *William Tinkler*, Co. G, 3d Battalion, South Carolina Infantry, was wounded in a bayonet charge at Spottsylvania, May 8th, 1864. He was conveyed to a Confederate hospital an hour after the reception of the injury. On examination, two apertures were discovered, one a triangular, ragged opening in the back, about one-half inch to the right of the tenth dorsal vertebra, and the other a small puncture, three inches below the right nipple, near the angle of the ninth rib. The patient stated that while in a stooping posture he was transfixed by a bayonet, and he asserted positively that he distinctly felt the withdrawal of the weapon. When admitted to hospital, his face was pallid and anxious and nostrils distended. Skin cool, pulse weak, but somewhat excited, breathing difficult and labored. There was slight oozing of blood from the posterior orifice, which was contracted, and bloody expectoration similar to that occurring in gunshot injuries of the lungs. These symptoms, conjoined with the direction of the wound, led to the belief that the right lung was transfixed. May 9th: Patient expectorates bloody mucus, complains of pain in right lung; has but little cough. Shock has passed off and he is tranquil. May 12th: Bloody expectoration ceased, but pain still continues. May 13th, posterior wound is healed over by scabbing. On May 16th, the patient was doing finely. There was some acceleration of the circulation and dyspnœa, but no physical symptoms of lung disease. He was sent to general hospital, May 17th, in fine spirits.

Percival, G., Corporal, Co. F, 5th South Carolina Battery. Perforating bayonet wound of chest. Spottsylvania, Virginia, May 8th, 1864. Treated in Confederate hospital. Dyspnœa and bloody expectoration. Doing well.

Of twelve men returned to duty or exchanged, one was afterwards pensioned. In three cases, the pleural cavity was believed to have been opened. The remaining cases were, probably, superficial flesh-wounds:

BRADY, OWEN, Private, Co. E, 1st Connecticut Artillery. Bayonet wound of thorax, September 20th, 1863. Treated in 3d division hospital, Alexandria. Returned to duty on September 28th, 1863. Not a pensioner.

CONROY, JAMES C., Private, Co. G, 16th United States Infantry. Penetrating bayonet wound, right breast, August 30th, 1865. Treated in Cumberland Hospital, Nashville. Returned to duty on October 14th, 1865. Not a pensioner.

DORSEY, RUSH, Private, Co. E, 17th West Virginia Volunteers, aged 21 years. Bayonet wound, inferior angle of scapula. Cavity of chest not opened. Grafton, September 26th, 1864. Treated in hospital at Grafton. Returned to duty on October 2d, 1864. Not a pensioner.

GARRETT, J. W., Corporal, Co. E, 50th Pennsylvania Volunteers. Bayonet wound of left side, April 13th, 1863. Treated in St. Aloysius Hospital, Washington. Returned to duty on October 22d, 1863. Not a pensioner.

HUBER, JACOB, Private, Co. H, 13th Indiana Volunteers, aged 29 years. Perforating bayonet wound of chest. Fort Darling, May 20th, 1864. Treated in hospital at Point Lookout, Maryland. Transferred to Veteran Reserve Corps on April 12th, 1865. Not a pensioner.

JOHNSON, JOHN, Private, Co. K, 6th Pennsylvania Cavalry. Bayonet wound of lung, June 17th, 1863. Treated in 1st division hospital, Annapolis. Returned to duty on July 7th, 1863. Not a pensioner.

MOORE, W. J., Private, Co. C, 15th New York Engineers, aged 24 years. Bayonet wound of breast, May 6th, 1864. Treated in 3d division hospital, Alexandria. Returned to duty on August 29th, 1864. Not a pensioner.

MURRAY, GEORGE, Private, Co. B, 39th United States Colored Troops, aged 24 years. Bayonet wound of left breast. Petersburg, July 30th, 1864. Treated in Summit House Hospital, Philadelphia. Returned to duty on September 27th, 1864. Not a pensioner.

O'Connor, Timothy, Private, Co. G, 138th New York Volunteers, aged 35 years. Bayonet wound of chest. September 10th, 1864. Treated in Mansfield Hospital, Morehead City, North Carolina. Returned to duty on March 27th, 1865. Not a pensioner.

Smith, Griffith, Drummer, Co. D, 168th New York. Bayonet wound of right breast. Treated in Douglas Hospital, Washington. Returned to duty on August 22d, 1863. His name does not appear on the Pension Records.

Squires, T. G., Private, Co. L, 11th Pennsylvania Cavalry. Bayonet wound of left side, and gunshot wound of shoulder. Stony Creek, June 29th, 1864. Treated in 1st division hospital, Annapolis. Returned to duty on November 16th, 1865. Examining Surgeon Martin Riger, of Brookville, Pa., reported, May 1st, 1866, that there was "nearly entire loss of motion in right arm from gunshot wound of right shoulder, entering just below the articulation, fracturing the spine of the scapula, passing out near the spine. Bayonet wound of right side, fracturing eighth rib. Reams's Station, June 29th, 1864. Disability one-half and permanent."

Case.—Private *James H. W. Vick*, Co. G, 8th Louisiana Regiment, aged 19 years, received a bayonet thrust in the left chest at Rappahannock Station, Virginia, on November 7th, 1863. He was sent to Washington, and admitted to Armory Square Hospital on November 9th. The left lung was penetrated one inch below the nipple, and the wound was three-fourths of an inch long. Bloody expectoration, November 8th, 9th, 10th.—less on 11th. Simple dressings were applied. The patient was transferred to the Old Capitol Prison on November 12th, 1863, for exchange, having completely recovered. A colored drawing of the recent wound was made by Hospital Steward W. Schultze. It is No. 79 of the Surgical Series of Drawings, S. G. O.

Punctured and Incised Wounds by Various Weapons.—Besides the sabre-cuts and bayonet stabs of the chest, there were reported twenty-seven instances of incised wounds and six examples of punctured wounds penetrating the thorax. Several of these recovered, though attended by lesions of the pleura and its contents:

Case.—Corporal Philip Carr, Co. G, 7th Louisiana Infantry, Colored Troops, was admitted to the Corps d'Afrique Hospital, New Orleans, Louisiana, December 15th, 1863, with an incised wound of the chest, penetrating the lower lobe of the right lung, inflicted with a dirk knife. Patient anæmic. Prognosis unfavorable. Discharged from service on March 10th, 1864; lung unsound. Not a pensioner.

Case.—Private M. P. Bailey, 2d Ohio Heavy Artillery, aged 21 years, was wounded at Lexington, Kentucky, in an affray in prison, July 26th, 1864, by a sheath knife inflicting a wound of the side and injuring the lower lobe of the left lung. He was sent to general hospital on the same day. Simple dressings were applied, and he was returned to jail on September 2d, 1864. The case is reported by Acting Assistant Surgeon Robert Peter.

Case.—Corporal Richard L. Gallatin, Co. B, 8th Iowa Volunteers, aged 23 years, was wounded at Memphis, February 9th, 1865, by a knife, which penetrated the right side below the twelfth rib. Admitted to Adams Hospital the following day, simple dressings were applied. He was returned to duty on April 20th, 1865. His name does not appear on the pension rolls. Acting Assistant Surgeon J. M. Study reports the case.

Case.—Private Barney McGinnis, Co. H, 7th Kansas Volunteers, was admitted to the hospital at Leavenworth City, Kansas, August 18th, 1862, with a punctured wound of the right side, by a knife entering below the axilla. The wound was received in camp in a drunken row. He was discharged from service on December 29th, 1863, on account of chronic pleurisy, accompanied by empyema, resulting from the wound. Not a pensioner.

But a large number of wounds of this group were fatal. It is common to entertain hopes of recovery when the patient has passed through the immediate danger of such wounds and safely survived the third day. But several of the following cases terminated fatally at a much later date:

Case.—Private Nathaniel Prather Co. A, 29th Illinois Volunteers, aged 21 years, was wounded in a brothel on December 14th, 1864. A knife penetrated the middle lobe of the right lung. He was admitted to Overton Hospital at Memphis, on the same day, and simple dressings were applied. Death resulted on December 17th, 1864. The case is reported by Assistant Surgeon J. C. G. Happersett, U. S. A.

Case.—Private James R. Brown, Co. E, 2d Minnesota Volunteers, aged 27 years, was admitted to the Marine Hospital, Chicago, March 12th, 1864, with two severe incised wounds through the left mamma, inflicted two days previously with a dirk knife. Death resulted on March 18th, 1864, from penetration of lung and pleuro-pneumonia. Ralph N. Isham, M. D., reports the case.

Case.—Private William T. McLean, Co. F, 64th Ohio Volunteers, aged 23 years, on April 10th, 1865, was stabbed with a bowie knife, which entered to the right of the sternum between the eighth and ninth ribs, penetrating the right lung. On April 24th, he was sent to the Asylum Hospital, Knoxville, where simple dressings were applied. Pleuro-pneumonia ensued, and death resulted from empyema on April 28th, 1865. The case is reported by Surgeon F. Meacham, U. S. V.

Case.—Private William L. Patch, Co. A, 10th Missouri Cavalry, aged 26 years, received, on November 24th, 1864, a wound from a knife, penetrating the thorax on the left side. Five days subsequently he was conveyed to the Overton Hospital at Memphis, and simple dressings were applied to the wound. Death resulted on December 12th, 1864. Assistant Surgeon J. C. G. Happersett, U. S A., reports the case.

CASE.—Private John Purtell, Co. G, 16th Illinois Volunteers, aged 24 years, was admitted to the hospital at Quincy, Illinois, February 19th, 1864, from Quincy Barracks, with a punctured wound of the right side of the body, between the seventh and eighth ribs, inflicted with a common pocket-knife during a row, at Memphis, while on veteran furlough. On admission, he was exhausted from loss of blood; but reaction came on the next day. The wound never healed, but continued to discharge from two sinuses above and below. Severe cough and all the symptoms of consumption followed. He at one time improved under the use of expectorants and cod-liver oil. The wound ceased discharging and he voluntarily offered to go to duty. He went out in the city on the next day, indulged too freely in drink, grew gradually worse, and finally died on May 1st, 1865. The case is reported by Acting Assistant Surgeon J. T. Wilson.

CASE.—Private James T. Fulton, Co. A, 12th Kentucky Cavalry, aged 21 years, received an incised wound of the chest in an affray at Camp Nelson, Kentucky, January 29th, 1865. The weapon, a pocket-knife, penetrated the cavity of the pericardium and slightly wounded the heart. He was immediately carried to the Convalescent Hospital near the camp. There was not excessive primary hæmorrhage; but great prostration. Absolute rest and low diet were enjoined, and the movements of the chest were restrained by simple dressings. The patient died on February 18th, three weeks after the reception of the injury. Acting Assistant Surgeon A. C. Rankin reports the case, giving no further details either in the register, monthly report, or burial certificate. Apparently no autopsy was made, and the diagnosis was hazarded without being verified.

Miscellaneous Injuries.—Two hundred and twenty-five cases of injuries of the chest of various kinds, caused by railroad accidents, falls, kicks from horses and mules, and other accidents, are recorded. Only five cases proved fatal. It will be remembered that the grave cases of fracture of the thoracic walls have been separated from this group:

CASE.—Private William Henry, Co. F, 81st Illinois Volunteers, aged 30 years, was admitted to Lawson Hospital, St. Louis, Missouri, January 13th, 1864, with contused wounds of the chest and shoulder, caused by falling from a mule and being dragged and trampled upon. Simple dressings were applied. He was transferred to the Veteran Reserve Corps on March 4th, 1864. Not a pensioner.

CASE.—Private Isaac G. Farquhar, Co. F, 36th Indiana, received a severe contusion of the sternum, by being run over by a wagon at Chickamauga, Georgia, on September 20th, 1863. He was treated in the field, and afterwards sent to Nashville, in the hospitals of which city he remained until January 1st, 1864, when he was returned to duty. Not a pensioner.

CASE.—Private Charles Winston, Co. E, 33d United States Colored Troops, was admitted to the 2d division hospital, Beaufort, South Carolina, February 3d, 1865, from field, with a slight contusion of the right side caused by a limb of a tree. He was returned to duty on March 17th, 1865. Not a pensioner. Assistant Surgeon W. P. Way, U. S. V. reports the case.

CASE.—Private William Weller, Co. C, 1st New Jersey Cavalry, aged 23 years, was admitted to Fairfax Seminary Hospital, Virginia, May 3d, 1864, with a contusion of the chest and back, received April 30th, by falling from a horse. On May 7th, he was transferred to Cuyler Hospital, Germantown, and returned to duty on May 7th, 1864. Not a pensioner. Assistant Surgeon Henry S. Schell, U. S. A., reports the case.

CASE.—Private Hiram Rosengrant, Co. D, 33d Illinois Volunteers, aged 27 years, was admitted to the St. Louis Hospital, New Orleans, March 2d, 1865, with a contused wound of the chest, received in an accident on the Opelousas Railroad the same day. He was returned to duty on March 7th, 1865. Not a pensioner. Surgeon A. McMahon, U. S. V., reports the case.

CASE.—Private Walter Baker, Co. D, 33d Illinois Volunteers, aged 22 years, was admitted to the St. Louis Hospital, New Orleans, March 2d, 1865, with an injury of the chest received in an accident on the Opelousas Railroad the same day. He was returned to duty on March 7th, 1865. Not a pensioner. The case is reported by Surgeon A. McMahon, U. S. V.

TABLE XXI.

Statement of Sabre and Bayonet Wounds and Miscellaneous Injuries of the Chest.

NATURE OF INJURY.	CASES.	DIED.	DISCHARGED.	DUTY.	UNKNOWN.
Sabre Wounds	9	1	4	4	.....
Bayonet Wounds	29	9	6	12	2
Incised Wounds from various Weapons	27	8	5	14	.....
Punctured Wounds from various Weapons	6	4	1	1	.....
Contusions	225	5	15	205	.....
Aggregate	296	27	31	236	2

Section II.

GUNSHOT WOUNDS OF THE CHEST.

These injuries are almost universally, and with great propriety, divided into penetrating and non-penetrating wounds. Other subdivisions are necessary, however, in the study of a large number of cases. Among the non-penetrating wounds are to be distinguished: first, those in which the skin, fasciæ, and other soft coverings of the thoracic walls are alone interested, and from this large group are separated the flesh-wounds of the region defined by the trapezii and posterior thoracic portion of the latissimi; secondly, the wounds complicated by fracture of the clavicle, scapula sternum, and ribs, or by injury of the bones or cartilages, without injury to the pleural cavity; and lastly the injuries to the contents of the thorax produced by large spent projectiles causing solutions of continuity internally, without external breach of surface.

Gunshot Flesh-Wounds of the Chest.—The returns of the flesh-wounds, though the entries of the individual cases were brief, were usually sufficiently detailed to permit an approximative estimate of the position and severity of the injury.

There were eleven thousand five hundred and forty-nine cases of gunshot flesh-wounds of the thoracic parieties, exclusive of the dorsal portion. The results were ascertained in all but six hundred and fifty-eight cases.* Of the remainder, eight thousand nine hundred and eighty-eight returned to duty in the Veteran Reserve Corps, or were exchanged after their recovery; seventeen hundred and ninety were discharged, the furloughed men who failed to return and the deserters from hospital being included in this aggregate;† and one hundred and thirteen died. In the one hundred and thirteen cases last mentioned, death was not always due to the immediate or even remote effects of the injury. Fifteen fatal cases of pyæmia, five of tetanus, eleven of hospital gangrene, eleven of hæmorrhage, one of erysipelas, and ten of pulmonary complications,—including six cases of pneumonia, two of hydrothorax, and one of empyema,—in these fifty-two cases, the injury and death were doubtless directly connected as cause and effect. Of fifty cases,—in which the fatal issue was referred to diarrhœa and dysentery in nineteen cases, to typhoid fever in twelve, to exhaustion in fifteen, to consumption in two, to anæmia and anasarca in two,—it is difficult to determine what relation, if any, existed between the injuries and deaths. Finally in eleven cases,—two of malarial fever, two of cerebritis, one of peritonitis, one of diphtheria, and five of small pox,—it is fair to conclude that the original injuries were less closely connected with the fatal results than were hospitalism and other morbific

* The undetermined cases were chiefly taken from Confederate reports, and there were no means of tracing them. This observation applies to all classes of cases derived from this source. Only in important instances of extraordinary injuries or operations, information has been sought by special correspondence with the medical officer or the patient, and has commonly been freely communicated when possible.

† See page 61, *ante*.

causes. It appears, then, that in uncomplicated superficial gunshot wounds of the soft coverings of the chest the mortality is exceedingly small. They commonly cause but little pain, and seldom interfere with the exploration of the lungs by auscultation. They have the disadvantage, however, of healing very slowly, especially when they produce a long groove or canal, or a fistulous track beneath the skin or through the muscles, forming what the French denominate *plaies en séton*. Their tedious cicatrization is doubtless due to the want of that absolute rest and immobility requisite for prompt reparation,—the muscular movements, especially those of respiration, being with difficulty restrained.

Foreign Bodies Lodged.—The lodgement of balls, bits of cloth, or other foreign bodies beneath the skin or in the muscles of the chest was not very infrequent. The following may serve as examples:

FIG. 207.—Conoidal ball rounded at apex and deeply grooved longitudinally.—*Spec.* 4400, Sect. I, A. M. M.

CASE.—Private Gilbert McMurtree, Co. F, 25th New York Volunteers, was wounded at Fredericksburg, December 13th, 1862, by a conoidal ball, which entered just above the interclavicular notch of the sternum and lodged near the superior angle of the scapula. He was treated in the field until the 19th, when he was transferred to the 3d division hospital, Alexandria, where, on the next day, Assistant Surgeon W. A. Conover, U. S. V., removed the missile. Simple dressings were applied to the wound. On January 9th, he was transferred to Lovell Hospital, Portsmouth Grove, Rhode Island, whence he was returned to duty on February 5th, 1863, and probably had no further inconvenience from the wound as his name does not appear on the Pension List. The missile, represented in the adjacent cut (FIG. 207), was contributed to the Museum by the operator. The longitudinal groove may have been caused by contact with bone; but there was no symptom of injury of the osseous tissue.

CASE.—Private B. F. Pierce, Co. A, 6th New Hampshire Volunteers, was admitted to Filbert Street Hospital, Philadelphia, September 3d, 1862. He had been hit in the side, at the second battle of Bull Run, August 30th, by a musket ball, which had run around under the fasciæ, externally to the chest, and had made its exit at a point between the fifth and sixth ribs, about the junction of their anterior and middle thirds. The wounds of exit and extranee were dressed by compresses spread with simple cerate. A profuse discharge of thin yellowish pus persisted for several days, when a large piece of cloth was removed from the track of the ball. The wound now cicatrized readily, and, on October 2d, he was nearly well enough to leave hospital. But subsequently, there was some pulmonary difficulty, and the man was discharged from service on December 4th, 1862. Examining Surgeon Ira S. Chase, of Grafton County, New Hampshire, reported, on June 8th, 1863, that the man was in feeble health, with cough and hepatized lungs at the lower part on each side, with violent palpitation from the least exertion or labor of any kind. Disability total and apparently permanent.

CASE.—Private Thomas Hagerty, Co. K, 3d Pennsylvania Cavalry, aged 37 years, was admitted to McVeigh branch 3d division hospital, Alexandria, Virginia, December 4th, 1863, having been wounded at the battle of Mine Run, November 27th, by a conical ball, which entered one inch to the left of and exactly in line with the point of the sternum, passed directly across the body and was extracted at the lower edge of the middle of the eighth rib. When wounded, he had in his coat-pocket a letter containing a quantity of hog's bristles, a looking-glass cased in a wooden frame, and a gutta-percha comb, portions of all of which were driven into, and were, at different times, extracted from the wound, large portions of the looking-glass case being extracted at four different points in the course of the ball. When admitted the patient was much prostrated, having been exposed to all the inclemencies of the season, without rations for several days, and transported in an army wagon some forty miles. He lingered for a long time at the point of death, and exhibited some symptoms of pyæmia, of which there were many cases in the hospital at that time, but, aided by constant care, together with the liberal exhibition of tonics and stimulants, with extra diet, the powers of nature overcame the prostration, and he recovered so far as to receive a furlough to go to Philadelphia on the 18th of May, 1864. He returned from furlough in July somewhat improved, but suffering greatly from pain in the region of the wound on any sudden movement, or upon being obliged to stoop. He was discharged from service on August 8th, 1864. Surgeon Edwin Bentley, U. S. V., reports the case.

Non-penetrating Injuries of Bones.—In this class, it has been sought to include only those gunshot wounds complicated by injury of the bones, or cartilaginous portion of the parietes of the chest, but unaccompanied by opening of the chest cavity or direct lesion of its contents. Many such cases recover without serious symptoms, but in others, inflammation of the pleura is induced either by the concussion caused by the projectile or by depression of the bone upon the pleura, or disease of the bones may ensue, with abscess and necrosis, and consecutive pneumonic inflammation may be lighted up at a period remote from the injury. The following illustrations may be of interest:

CASE.—Corporal Walter Gregory, Co. F, 173d New York Volunteers, aged 22 years, was wounded at Pleasant Hill, Louisiana, April 9th, 1864, by a conoidal ball, which fractured the ninth rib. He was taken prisoner and remained with the

enemy until June 16th, when he was paroled and sent to the University Hospital, New Orleans. Simple dressings were applied. He was transferred to Camp Parole on February 2d, 1864, and was mustered out of service on October 18th, 1865. The Pension Examining Board at Boooklyn, New York, report, December 6th, 1871: "gunshot wound of left thorax, with injury to eighth and ninth ribs. The integuments are adherent to the ribs at the point of injury, and the muscles attached to the parts are diminished in power."

Case.—Private Edward Billingham, Co. M, 1st United States Cavalry, aged 21 years, was wounded near Boonsboro', Maryland, July 8th, 1863, by a conoidal ball, which passed through the anterior portion of the upper third of the left arm, grazing the bone, emerged, and entered the left breast, one inch above the nipple, passed in a direct line transversely across the chest, fracturing the sternum, and lodged in the anterior fold of the right axilla. He was admitted, on the next day, to the hospital at Frederick, Maryland, breathing rapidly and with considerable difficulty. The ball was immediately extracted. On the next day dyspnœa set in, due to double pleurisy from contiguity of wound to the pleura and depression of the sternum. Stimulants and anodynes were administered, and dry cups applied on the right side of the chest. The patient improved rapidly. By October 19th, the wounds were healed, and he was returned to duty. He was discharged on March 26th, 1864. A considerable portion of the sternum had exfoliated. Examining Surgeon William D. Scarff examined the man on July 27th, 1864, but gives no additional information.

Case.—Private John Kearney, Co. G, 69th New York Volunteers, was wounded at Malvern Hill, July 1st, 1862, a bullet striking his chest, about two inches to the left of the median line, at the fourth rib, and lodging in the lower portion of the body of the sternum. Various efforts were made to remove it by counter openings, but in vain, and, after nine months in general hospitals in Washington and New York, he was discharged, as unfit for service. The wound had healed to a certain extent, and he went to work at his trade of shipwright. He reënlisted in February, 1864, the wound, at the time of examination, presenting the ordinary appearances of old gunshot wounds. He was immediately sent to Riker's Island, New York Harbor, where he underwent a great deal of unnecessary exposure to the elements, and also to other deleterious influences for which that depot was, at one time, notorious. The wound broke out afresh, the surrounding parts became swollen, red, and painful, and an attack of broncho-pneumonia was superadded. An examination, by Nélaton's probe, indicated the nature and position of the bullet, the existence of which had been previously doubted or denied. It was removed, without difficulty, by simple incision. No spiculæ of carious bone were found loose, though the sternum exhibited a depression corresponding, in some measure, to the size of the bullet. About an ounce of fœtid pus was discharged from the surrounding tissues. The missile was contributed to the Army Medical Museum, with the foregoing account, by Surgeon William O'Meagher, 69th New York Volunteers. It is shown in the adjoining wood-cut. Not a pensioner.

Fig. 208.—A flattened conoidal musket ball successfully removed from the sternum. *Spec.* 4558, Sect. I, A. M. M.

Case.—Private J. E. A———, Co. I, 32d New York Volunteers, having been wounded in front of Richmond, on June 25th, 1864, was sent to Washington, and admitted into Mount Pleasant Hospital. The sternum was transversely fractured at the articulation of the third and fourth ribs by a round ball, which did not penetrate the chest. The wound was perfectly round, and from the first showed no healthy action, being covered with a thick, unhealthy slough, accompanied by a copious, fœtid discharge, and inflammation of the surrounding tissues. The administration of tonics and stimulants, and the application of cold-water dressings failed to avert the fatal issue, which occurred on August 1st, 1862. The autopsy revealed destruction of the costal cartilages in the vicinity of the wound, which was about two inches in diameter, and ulceration of the mediastinum beneath. There were very fine adhesions of the pleural to the thoracic parietes, particularly of the right side; the heart was considerably hypertrophied, and showed evidences of fatty degeneration. The fractured sternum, shown in the adjoining wood-cut (Fig 209), was contributed to the Army Medical Museum, with the history, by Assistant Surgeon C. A. McCall, U. S. A.

Fig. 209.—Sternum transversely fractured by a round ball. *Spec.* 34, Sect. I, A. M. M.

Case.—Private Chalkley Berry, Co. I, 28th New Jersey Volunteers, aged 24 years, was wounded at Fredericksburg, December 12th, 1862, by a ball, which, entering the back on the right side, within a half inch of the vertebral column, opposite the spinous process of the sixth dorsal vertebra, and apparently passing upward beneath the scapula and over the shoulder, fractured the right clavicle just within the coraco-clavicular ligament, making a complete transverse fracture, and lodging in the soft tissues below and in a vertical line with the point of fracture, where it was readily recognized. He was treated in the field hospital of the 2d division, Second Corps, and on the 18th was transferred to the Presbyterian Church Hospital, Georgetown; on December 30th, 1862, to Harewood Hospital, Washington, and, on January 31st, 1863, to Broad and Cherry Streets Hospital, Philadelphia. When admitted, the wound of entrance had entirely healed, and firm union had taken place at the seat of fracture, the inner fragment overlapping. The patient stated that, a few days after the reception of the injury, he spat a small amount of clotted blood, and continued to do so at intervals for two days, after which it entirely ceased. He also had some difficulty of respiration for a short period but was not treated for any disease of the lung. On February 22d, 1863, the ball was cut out by Surgeon John Neill, U. S. V. Berry recovered without any serious symptoms at any time, and was discharged from service on March 12th, 1863. The missile, represented in the adjacent wood-cut (Fig. 210), was a musket ball, notched at the apex and grooved on the side. It was contributed, with the history, by the operator. Not a pensioner.

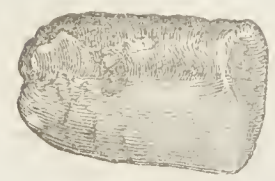

Fig. 210.—An elongated ball grooved by impact on the clavicle. *Spec.* 378, Sect. I, A. M. M.

Case.—Private William A. Furbush, Co. G, 16th Maine Volunteers, aged 18 years, was wounded at Fredericksburg, Virginia, December 13th, 1862, by a ball, which struck about the junction of the external and middle thirds of the right clavicle, passed downward, backward, and inward, and emerged some inches below the spine of the scapula. There was some comminution of the external part of the clavicle, and the direction of the ball made it certain that injury had been inflicted in the scapula. He was treated in the field, and, on the 18th, sent to St. Aloysius Hospital, Washington. When admitted, there were symptoms of pneumonia, though otherwise there was no evidence of injury to the lung. Soon afterward, persistent diarrhœa set in, which, with profuse suppuration from the wound, gradually prostrated him. Some detached pieces of bone were removed, and the sharp ends of the clavicle taken off. Supporting treatment. Death resulted on January 13th, 1863. Necropsy: Aside from the injury of the clavicle, the coracoid process was found entirely detached, the spine of the scapula fractured along the line of its junction with the body, the ball having struck at the junction of the spine and body, carrying away spiculæ from both. On opening the joint an interesting complication was found, not suspected during life. The cartilages were eroded, and the head of the humerus presented a carious appearance, and, at one point, looked as if it had been injured by some detached fragment. From this point, there was free communication with the wound, admitting a flow of pus into the joint. There was no opening in the cavity of the chest. The right pleura-pulmonalis was covered with lymph. Both lungs were congested posteriorly, and a small superficial abscess was found in the inferior lobe of the right. Liver considerably enlarged but otherwise healthy. The pathological specimen is No. 720, Section I, A. M. M., and was contributed, with a history of the case, by Assistant Surgeon Alexander Ingram, U. S. A.

Several hundred cases were returned as non-penetrating gunshot fractures of the ribs, but without adequate evidence that the costal and visceral pleuræ and the pulmonary parenchyma had absolutely escaped injury.

The three following abstracts relate to cases of fractures of the scapula, in which the thoracic cavity was not opened primarily, but consecutive pleuritis or pleuro-pneumonia resulted from the injuries:

Case.—Private J. P———, Co. H, 14th Indiana Volunteers, aged 24 years, was wounded at Antietam, on September 17th, 1862, and was admitted to hospital at Frederick on September 27th. A ball had entered at the spine of the right scapula, and emerged just below and posterior to the acromion process of the same side, fracturing the entire spine and comminuting it to a great extent. On October 14th, the posterior wound being enlarged by an incision, two inches of the spine of the scapula was removed, and its body found to be fractured to some extent. Subsequent treatment consisted in the application of lead-water and laudanum to the wound, and the administration of tonics and stimulants. The case progressed favorably. On November 2d, the wounds were reopened to allow the evacuation of pus, and a tent of oakum smeared with resin cerate was introduced. On November 6th, it was discovered that the capsular ligament was destroyed; the patient was seized with chills; his general condition failed, and he died of pleurisy, with effusion, on November 15th, 1862. The autopsy revealed extensive pleurisy, with effusion over the left side; a considerable quantity of pus in the vicinity of the scapula, and the absence of cartilage from the head of the humerus, which had undergone slight necrosis about the head and anatomical neck. The fractured scapula, having the upper third of the humerus attached, was contributed to the Army Medical Museum, with the history, by Acting Assistant Surgeon W. W. Keen, jr., and is figured in the adjoining wood-cut (Fig 211).

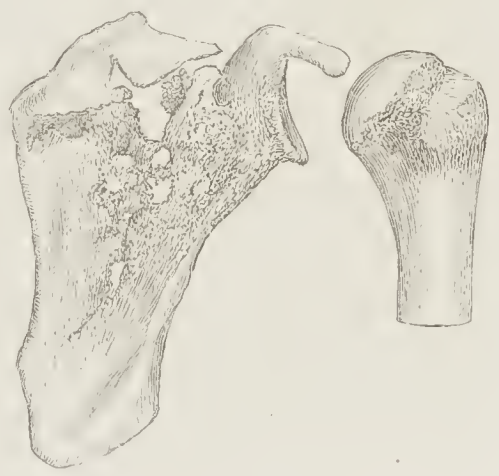

Fig. 211.—Scapula and portion of humerus showing secondary disease after gunshot injury. *Spec.* 827, Sect. I, A. M. M.

Case.—Private F. T———, Co. D, 5th New Jersey Volunteers, aged 46 years, was admitted to Carver Hospital, Washington, on May 9th, 1863. He had been wounded, on the 3d, at the battle of Chancellorsville. The shock to the system had been very severe. He was conveyed to the 1st division hospital of the Third Corps, and his wound, attended by great laceration of the soft parts, was dressed under the direction of Surgeon J. S. Jamieson, 86th New York Volunteers. When he rallied he was sent to Washington on an hospital transport steamer. A fragment of shell had struck the back, over the right scapula, causing a compound comminuted fracture. The wound was closed with sutures, and a linseed poultice applied; the patient was allowed sixteen ounces of wine in the twenty-four hours, and half diet. Brandy and quina were subsequently prescribed. Death occurred on May 12th, 1863. At the autopsy, the tissues surrounding the wound were found to be involved to a very considerable extent; serous effusion had taken place, and a collection of pus was found below the neck of the scapula. The extent of the injury to the bone is shown in the adjoining wood-cut (Fig. 212). The spine and a large portion of the dorsum of the scapula are carried away, and a fissure extends into the glenoid cavity. The extremity of the acromion process, separated from its attachments, is present, but is misplaced in the cut. The specimen was contributed to the Army Medical Museum, with the history, by Surgeon O. A. Judson, U. S. V.

Fig. 212.—Right scapula extensively fractured by a fragment of shell. *Spec.* 1217, Sect. I, A. M. M.

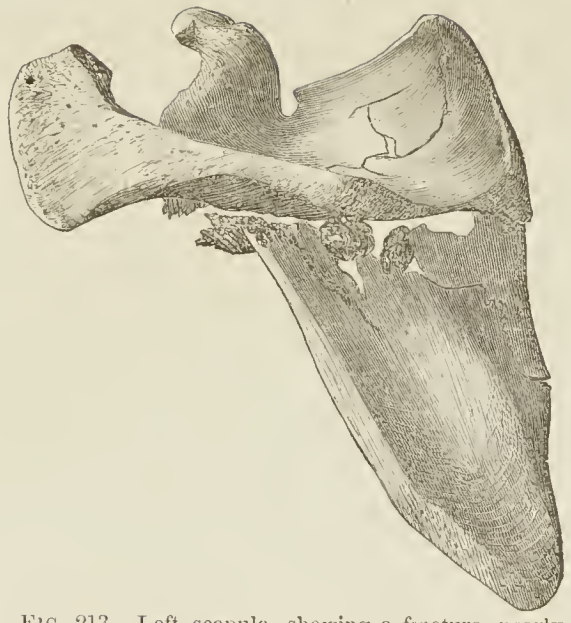

FIG. 213.—Left scapula, showing a fracture, nearly parallel with the spine of the scapula, with two fragments of a conoidal musket-ball. *Spec.* 178, Sect. I, A.M.M.

CASE.—Private W. F———, Co. F, 18th Massachusetts Volunteers, aged 30 years, was wounded at Bull Run, August 30th, 1862, and was admitted to hospital at Alexandria, on the following day. There was a wound of the left arm, about four inches below the acromion process of the scapula, to which cold water was applied. On the 3d, and again on the 5th of September, fragments of the ball, with a few pieces of comminuted bone, were removed through an incision on the outer edge of the scapula, affording the patient considerable relief. A profuse discharge from the wound soon followed, and on the 19th, symptoms of purulent infection set in. An active treatment by stimulants, quinia, iron, and ammonia, was instituted, but unavailingly. Death resulted on September 25th. The necropsy showed a fracture of the head and dorsum of the scapula, extending below and parallel to its spine. A large collection of extravasated blood was found beneath the scapula and between the muscles of the shoulder, which were disorganized, and of a greenish hue. There was extensive serous effusion in the left pleural cavity, and numerous metastatic foci in both lungs. The fractured scapula, with two fragments of ball attached, and having upon its venter a thin layer of friable, yellowish exudation, was contributed to the Army Medical Museum by Acting Assistant Surgeon W. H. Butler, and is figured in the adjoining wood-cut (FIG. 213).

Internal Injuries without External Wounds.—The third and last subdivision of non-penetrating gunshot injuries of the chest, comprises those infrequent cases in which lesions of the contents of the cavity are produced without fracture of the bony or cartilaginous case or even solution of continuity in the soft parts. The pension returns would indicate that such accidents were not uncommon; but the instances in which the diagnosis of the internal lesions has been made out with precision at the time of the reception of the injury are very rare. The truth is that the severe contusions by large spent shot, causing ruptures of the lung and heart, or laceration and great extravasation, are fatal on the field, and very rarely came under the surgeon's observation, while the slight concussions of the contents of the chest cavity often pass unnoticed:

CASE.—Private Harry Morris, Co. A, 115th Pennsylvania Volunteers, aged 24 years, was wounded at Gettysburg, July 1st, 1863, by a large spent fragment of shell, which caused a very serious concussion of the left chest. He was conveyed to the hospital of the First Corps, where he remained until the 24th, when he was transferred to Camp Letterman Hospital. On admission at Camp Letterman, the patient's condition was very low. There was extensive ecchymosis of the left side, and he was troubled with cough and dyspnœa, and was unable to take any solid food. There appeared to be extensive inflammation of the left lung. Cough mixtures, tonics, and stimulants were administered, and the chest was rubbed with a stimulating lotion. On the 27th, he raised some bloody matter with difficulty. He gradually sank, and died on August 3d, 1863. There was no opportunity of making an autopsy. Assistant Surgeon C. A. Hamilton, 76th New York Volunteers, reports the case.

CASE.—Private H. H. Bonham, Co. F, 7th Wisconsin Volunteers, aged 17 years, was wounded at the Wilderness, Virginia, May 7th, 1864, by a fragment of shell, which struck the left breast near the sternum, two inches below the clavicle. The cavity of the chest was not opened; but there was lesion of its contents by contusion. He was carried to the hospital of the 4th division, Fifth Corps, and a simple bandage was placed about the chest. On May 11th, he was transferred to Harewood Hospital at Washington; on the 15th, to Cuyler Hospital, Germantown, whence he returned to duty on July 5th, 1864. Discharged from service on August 7th, 1865. Pension Examiner J. H. Hyde, M. D., reports, May 23d, 1868, that Bonham "suffers from palpitation of the heart. He expectorates blood, and has almost entirely lost the use of his left arm. Disability three-fourths and permanent."

CASE.—Corporal Joseph Kinkade, Co. B, 68th United States Colored Troops, aged 25 years, received a contusion of the chest, with internal injury, caused by the bursting of a torpedo at Fort Blakely, Alabama, April 10th, 1865. On the 15th, he was admitted to the Corps d'Afrique Hospital, New Orleans, and simple dressings applied. He recovered and was discharged from service on June 17th, 1865. Surgeon Francis E. Piquette, 86th United States Colored Troops, reports the case. His claim for pension is pending.

CASE.—Corporal William H. Mix, Co. K, 2d New Hampshire Volunteers, aged 22 years, received a contusion of the left side of the thorax by a cannon ball, at Gettysburg, July 2d, 1863. He was taken to the field hospital of the Third Corps, where he remained until the 11th, when he was transferred to Summit House Hospital, and on the 29th, to Mower Hospital, Philadelphia. He stated that when hit his breast was protected by a book and blanket. Blood was discharged from the lungs, in considerable quantities, for five days after the reception of the injury. When admitted, the patient rested badly and complained of pain in the injured breast; he expectorated considerable muco-purulent matter. Volatile liniment was applied with friction. He improved rapidly, and, on September 25th, 1863, was returned to duty. He is not a pensioner. Surgeon J. Hopkinson, U. S. V., reported the case.

CASE.—Private Dominick Barrett, Co. D, 6th Indiana Volunteers, aged 42 years, was wounded at Dallas, Georgia, May 27th, 1864, by a conoidal ball, which struck the thorax anteriorly, producing a very serious concussion of the lung without external injury; he also received a wound of the hand. He was carried to the hospital of the 3d division, Fourth Corps. On June 6th, he was transferred to Totten Hospital, Louisville; on July 3d, to the hospital at Madison, Indiana, and on September 17th, 1864, to Indianapolis, for muster out of service. Not a pensioner. Surgeon A. C. Swartzwelder, U. S. V., reports the case.

CASE.—Sergeant Henry Alic, Co. A, 12th United States Infantry, was admitted to Harewood Hospital, Washington, May 6th, 1863, with a contused wound of the left side of the chest, received at the battle of Chancellorsville, on May 3d. A cannon ball of spent force struck the chest between the fifth and twelfth ribs, discoloring the whole side of the chest. The patient expectorated a large amount of blood, and suffered greatly from dyspnœa and other symptoms of injured lung. He gradually improved, and was returned to duty on July 28th, 1863. Not a pensioner. Surgeon Thomas Antisell, U. S. V., reported the case.

CASE.—Private Henry Bloss, Co. A, 3d Michigan Volunteers, aged 28 years, received an injury of the lung by concussion of the chest from a large fragment of shell, at the Wilderness, May 6th, 1864. He was treated in the field until May 24th, when he was transferred to Harewood Hospital, Washington. Anodynes were administered and rest enjoined. On February 20th, 1865, he was transferred to the Post Hospital at Camp Chase, Ohio, and, on February 25th, to Tripler Hospital, Columbus, whence he was discharged from service on April 10th, 1865, on account of expiration of term of service. Acting Assistant Surgeon C. A. Perdue, who reports the case, says: "In this case there is a tendency to mental aberration. The lung is in a bad condition." Bloss is not a pensioner.

CASE.—Private James Lloyd, Co. G, 1st New Jersey Cavalry, aged 26 years, received a severe contusion of the chest, with laceration of the lungs, by a solid shot, at Sailor's Creek, Virginia, April 6th, 1865. He was at once conveyed to the field hospital of the 2d division, Cavalry Corps, where morphia was administered. On the 12th, he was transferred to the Ninth Corps Hospital; on May 7th, to Armory Square Hospital, Washington, and on May 27th, to the hospital at Whitehall, Pennsylvania, whence he was discharged from service on June 23d, 1865. He is not a pensioner. Assistant Surgeon E. J. Marsh, U. S. A., reports the case.

Seventeen other cases, believed to belong to this group, were received at the field hospitals. Thirteen terminated fatally in from twelve hours to four days from date of injury. Unfortunately, the notes are very brief, and no autopsies were made. But the experienced surgeons who observed these cases would not have discriminated them in their reports on trivial grounds, and the mention of the existence of pneumothorax or hæmothorax, or profuse hæmoptysis as attendant symptoms, and of pleurisy and pneumonia in the survivors, indicate that these cases were regarded as lesions of the contents of the thorax without external breach of surface. M. Gosselin* suggests, as the probable mechanism of this lesion, that the lungs being distended in inspiration, and the glottis being spasmodically closed at the moment the external violence is applied, the pulmonary tissue must rupture, if the force is great enough, as it cannot yield. This is, doubtless, the true explanation in the cases to which this writer restricts his inquiries, but is not required in those instances in which the lung is lacerated by fractured ribs, the integument remaining intact.

Attention must here be called to an awkward typographical error on page 472, by which eight thousand nine hundred and eighty-eight soldiers with flesh wounds of the chest are "returned to duty in the Veteran Reserve Corps." The omission of the words "*or to modified duty*" escaped the vigilance of the proof-readers. The passage should read, "were returned to duty, or to modified duty in the Veteran Reserve Corps, or were exchanged, etc."

* GOSSELIN, I, *Recherches sur les Déchirures du Poumon sans Fractures des Côtes correspondantes*, en *Mém. de la Soc. de Chir.*, Paris, 1847, T. I, p. 201. Hewson (*Med. Obs. and Inq.*, Vol. III, p. 372) appears to have first called attention to this particular point in chest injuries. He cites examples from Méry (*Mém. de l'Acad. Royale des Sciences*, 1713), and Cheston (*Path. Inquiries from Dissec. of Morb. Bodies*, Gloucester, 1776). Laennec, in describing pneumothorax, quotes Hewson. Breschet (*Dict. des Sci. Méd.* Paris, 1815, T. XII, ART. *Emphysème*), Murat (*Nouveau Dict. de Méd.* Paris, 1842, ART. *Emphysème*), and Boyer (*Traité*, 5th ed.), allude to the possibility of the accident under consideration. Gosselin enters fully into the subject and cites cases reported by Roques (*Arch. gén. de Méd.*, 1829), Saussier (*Thèses de Paris*, 1841), Smith (*Dublin Quart. Jour.*, 1840), Paillard (*Leçons Orales* of Dupuytren, T. VI, p. 308), and Lafargue (*Jour. de Méd. de Bordeaux*, 1840, p. 105). Paillard's cases alone were examples of gunshot injury. They are detailed in his *Rélation* of the Surgery at the Siege of Antwerp, where he gives also (p. 22) the interesting case of Captain Coultault, an engineer officer, struck in the trenches at Antwerp, by a large spent cannon-ball, over the lower lateral portion of the chest, and almost instantly killed. The clothing and integuments were uninjured; but Professor Forget found five ribs fractured, with such comminution as to permit the hand to be passed behind the skin and pulpified subjacent soft parts, far into the cavity of the thorax. Jobert (*Plaies d'Armes à feu*, pp. 162, 169) gives a good account of this form of injury for the military surgeon. He does not exclude the cases in which the ribs are fractured, as does M. Gosselin. Professor S. D. Gross (*System*, 5th ed., Vol. II, p. 444) accepts M. Gosselin's explanation of the accident, as does Dr. John Ashhurst, jr. (*Principles and Practice of Surgery*, Phila., 1871, p. 355). The latter has collected sixteen cases of this nature from the records of the surgery of civil life including those observed at the Pennsylvania and Episcopal Hospitals, Philadelphia, by Dr. E. Hartshorne and Dr. C. C. Lee.

Penetrating Gunshot Wounds of the Chest.—We pass now to the consideration of a class of very serious injuries of the chest, comprising complicated lesions of the bony, cartilaginous, and muscular case composing the thorax,—the vertebræ, sternum, ribs, costal cartilages, and diaphragm,—of the contained viscera,—the lungs and pleuræ, heart and great vessels and nerves, the œsophagus and thoracic duct,—and also of the clavicle and scapula, which partly protect the cavity.

Of the twenty thousand two hundred and sixty-four cases of gunshot wounds of the chest returned in the war, eleven thousand five hundred and forty-nine are briefly discussed in the previous subsection, and eight thousand seven hundred and fifteen have been placed in this.

Viewed in the aggregate, the ratio of mortality of cases of this category is very great, while in some of the divisions, recoveries are exceptional, and the fatality may be regarded as nearly uniform. Abstracting three hundred and twelve cases, the terminations of which cannot be traced, the death-rate of the remaining eight thousand four hundred and four is 62.5; but in the division of wounds of the heart, for example, it rises to 99.9. Hence the necessity for numerous subdivisions, in order that similar cases may be compared.

Penetrating and Perforating Wounds without Fracture.—Many cases were reported of perforation of the chest, through intercostal spaces, by small projectiles, without any lesion of the bones. In the fatal cases, in which the course of the ball was traced, it was generally found to have traversed the lung, and that death had resulted from hæmorrhage or from empyema. In the cases of recovery, the existence of wounds of the lung was not always determined with satisfactory precision, and, in some instances, the missile probably ran around the pleural surface of a rib or aponeurosis, without lesion of the lung substance. Such injuries are unquestionably less fatal, other conditions being equal, than those accompanied by fracture, and particularly by fracture at the entrance wound. Indeed the complications produced by the splinters forced inward are often more formidable than the lesions caused in the lung by the ball itself. Some examples of these wounds, confined to the soft parts, which had a favorable termination notwithstanding the injury to the lung, may here be cited. The first two abstracts refer to instances complicated by injury to the brachial plexus of nerves:

Case.—Private Edward Parsons, Co. D, 13th New York Cavalry, aged 21 years, having been accidentally wounded at Berlin, Maryland, on July 19th, was admitted to hospital at Frederick, on July 24th, 1863. A conoidal ball had entered at the anterior fold of the right axilla, grazed the right lung, and emerged three inches above the right nipple. The patient spat blood in small quantities, and complained of pain in the right side; his general health and appetite were good. Wet cups were applied to the seat of pain. On July 28th, there was traumatic neuralgia of the median and ulnar nerves, which was alleviated by the application of a blister. August 3d, the neuralgia was confined to the wrist and hand. August 9th, neuralgia in the little and ring fingers only. By September 10th, the patient was much improved, but had dyspnœa on exposure. He was discharged the service on December 9th, 1863, at which time the neuralgia had entirely subsided, leaving the wrist and hand slightly rigid. On December 17th, 1863, Pension Examiner Charles Rowland reports, "this soldier is totally disabled; his forearm is at present entirely useless, but will improve and finally recover." A communication from the Commissioner of Pensions, May 5th, 1868, informs us that this man's claim for pension was rejected, there being no evidence of his being wounded in the line of duty.

Case.—Private John Conthard, Co. D, 123d Indiana Volunteers, aged 21 years, was wounded, at Kenesaw, Georgia, June 17th, 1864, by a conoidal ball, which passed through the soft part of the left arm, entered the thorax between the fifth and sixth ribs, passed through the posterior portion of the left lung, and emerged between the sixth and seventh ribs, three inches from the spine. He was treated in the field, and, on July 1st, sent to the hospital at Knoxville, Tennessee. Simple dressings were applied to the wound. He received a furlough on July 26th, at the expiration of which he reported to Washington Park Hospital, Cincinnati, Ohio. Discharged from service on January 2d, 1865. Pension Examiner Edward Mead reports, the day after discharge, that "the ball entered upper third of left arm, passed inward and entered the upper portion of left lung and out at right side of spine in dorsal region. Gangrene followed, leaving a large cicatrix. Hæmoptysis continued, as alleged, until three weeks ago. Hand is paralyzed and action of shoulder limited. Probable fracture of spinous processes of two dorsal

vertebræ. Arm nearly useless. Functions of lung impaired. Disability total and permanent." Pension Examiner William Owens reports, September 25th, 1866, that the pensioner's health was good. The lung can be fully inflated, but gives indications of weakness in talking, walking, or running briskly. No hæmorrhage has occurred for a year past. Pension Examiner John L. Neilson reports, November 30th, 1869, that the brachial plexus is injured, consequent paralysis of arm. The left arm and shoulder are shrunken, and he has very imperfect use of the hand, although the forearm seems well developed. The left shoulder is depressed and the pectoral muscles wasted. Auscultation shows nothing more than bronchial mucous rales. Numbness of hand and imperfect circulation. Pain at seat of wounds is aggravated by cold or stormy weather. The Pension Examining Board, consisting of Drs. McReynolds, White, and Conner, reports, May 4th, 1870, that the "ball entered inside of left deltoid and passed out of right side of spine, * * injury of median nerve, * * two inches expansion of chest, respiration a little rude, * * wound of median nerve."

CASE.—Corporal Joseph J. Young, Co. D, 1st Minnesota Volunteers, aged 34 years, was wounded at Antietam, Maryland, September 17th, 1862, by a musket ball, which entered the chest between the fourth and fifth ribs, one and a half inches from the sternum, passed through the right lung, and emerged at the lower and anterior edge of the right scapula, the ball having glanced on striking the scapula. He was treated in the field, and, on September 21st, transferred to the hospital at Frederick, Maryland. When admitted he was in a very debilitated state, having lost much blood. There was slight pneumonia, which soon subsided. Hæmorrhage from the wound occurred daily. A supporting treatment was adopted. Erysipelas supervened October 16th, but subsided under the application of a solution of lead and opium. On December 27th, he was transferred to Falmouth, Virginia, and discharged from service on January 1st, 1863. Pension Examiner A. E. Ames reports, May 25th, 1867, "wound open and frequently discharging. Is much troubled with pain in region of liver. Disability permanent and equal to loss of limb." No later report at the Pension Office, except that the pensioner had removed to Oregon, and was last paid at San Francisco, September 4th, 1871.

CASE.—Private Samuel Graves, Co. B, 7th Kansas Cavalry, was wounded at Arkansas Post, Arkansas, January 11th, 1863, by a pistol ball, which entered above the right nipple, passed through the lung, and emerged below the right scapula. Free hæmoptysis occurred directly upon injury. Sputa were bloody for a long time. He was admitted, on January 23d, to Adams Hospital, Memphis. Being of a feeble constitution, naturally, he did not gain strength rapidly. He was discharged from hospital about April 1st, 1863, at which time he complained of a tightness of the thorax, preventing him from taking a full inspiration. There was probably an adhesion of the lung both at the anterior and posterior perforation. Both the external wounds had entirely healed. He had very little cough and no bloody sputa. He is not a pensioner.

In reporting the following case, Surgeon D. C. O'Keefe* remarks: "This case presents two points of deep interest. The first is that of an unquestionable wound through the lung without any symptom indicating that injury, except the original hæmoptysis. The second was the undoubted severing of the left subclavian artery, as indicated by the absence of pulsation in the radial or brachial artery, which was carefully and frequently sought for, and of the absence of which there could have been no mistake:"

CASE.—Sergeant *Cyrus L. Nabors*, Co. F, 2d Arkansas Regiment, aged 29 years, constitution good, occupation farmer; wounded on May 19th; admitted to the Institute Hospital, Atlanta, May 20th, 1864. Gunshot wound by minié ball, which entered posteriorly two and a half inches to the left of the spinal column, opposite the body of the fifth dorsal vertebra, and, passing obliquely forward, made its exit between the third and fourth ribs, at a point three inches to the left of the sternum. Alarming hæmorrhage and hæmoptysis followed the receipt of the injury. On admission, the patient was greatly debilitated from hæmorrhage; there was neither cough, constitutional disturbance, nor hæmoptysis; no pulse could be felt at the wrist in the radial artery of the affected side, nor in the brachial as far as the axilla. From admission, this patient continued to do well without a single bad symptom. The arm on the wounded side was considerably atrophied and somewhat paralyzed, due, doubtless, to the cutting off of the supply of blood and nervous influence. June 30th, doing well; furloughed home.

CASE.—Private Joseph Forrest, Co. F, 13th Missouri Cavalry, aged 21 years, was wounded at Osage, Missouri, October 25th, 1864, the ball entering at the outer margin of the left axilla and penetrating the thorax. He was admitted to the hospital at Fort Scott, Kansas, on the next day and water dressings were applied to the wound. Discharged from service April 27th, 1865. Pension Examiner Julian Bates reports, June 7th, 1865, that "the ball is believed to be still lodged in the chest. The pensioner suffers from cough and disturbed respiration through the chest, and is greatly emaciated." He improved afterward, and his pension was discontinued on March 3d, 1869.

In the four following cases the missile is supposed to have traversed the thoracic cavity incompletely, then lodging within it:

CASE.—Private Ludwig Kuhn, Co. D, 26th Wisconsin Volunteers, aged 24 years, very robust, having been wounded at Gettysburg, on July 1st, was sent to Philadelphia, and admitted to Satterlee Hospital on July 9th, 1863. A conoidal musket ball had entered to the right of the inferior angle of the right scapula, penetrated the thoracic cavity and lodged. For several days after the reception of the injury, there was hæmoptysis, which is reported to have ceased after the patient was bled from the left arm. The remaining treatment consisted of cold-water dressings, linseed poultices, and cerate dressings to the wound after

* *Confederate States Medical and Surgical Journal*, Richmond, 1865, Vol. II, No. 2, p. 33.

the removal of the ball. There were no serious symptoms during the progress of the case, and but slight indication that the lung had been penetrated. The patient had nearly recovered his health by December 31st, 1863, when he was transferred to the Veteran Reserve Corps. He was discharged from service on June 9th, 1864, and subsequently enlisted in Co. I, 214th Pennsylvania Volunteers. During his second enlistment he was treated in the hospitals at Washington and Philadelphia. The patient stated that his wound was so painful as to deprive him of rest, and he was unable to lie upon his back. The wound had healed, with the exception of a fistulous opening, and the constitutional condition was good. In February, 1866, Pension Examiner James Neil reports "there are pleuritic adhesions and partial consolidation of the lung. The patient looks well."

Case.—Captain Theodore A. Hope, Co. E, 91st Pennsylvania Volunteers, aged 26 years, was wounded at Five Forks, Virginia, March 31st, 1865, by a conoidal ball, which entered the right chest three inches above the nipple, between the second and third ribs, passed downward through the lung, and lodged in the left side of the diaphragm. Hæmoptysis occurred on the reception of the injury. He was taken to the hospital of the 1st division, Fifth Corps, where he remained until April 29th, when he was transferred to Armory Square Hospital, Washington. There was pneumonia of right side when admitted. Poultices were applied to the wound, and anodynes and stimulants given. Morphia, in half-grain doses, was given hypodermically twice a day. On June 1st, the patient vomited a large amount of bilious matter, which would also flow from the wound after a short cough. On August 19th, he was transferred to Douglas Hospital, Washington, and on the 30th to Mower Hospital, Philadelphia, whence he was discharged from service on October 28th, 1865. Pension Examiner J. H. Gallagher reports, February 14th, 1866, that "walking and exercise cause lancinating pains in the chest, and dyspnœa. There is constant dull heavy pain in the left side, at the point of lodgement of the ball. In dull and changeable weather he is weak and depressed; countenance distressed." No further report to March, 1872, when the Captain was still an invalid.

Case.—Private John Fouts, Co. D, 5th Ohio Volunteers, aged 17 years, was wounded at Dallas, Georgia, May 27th, 1864, by a musket ball, which entered the posterior part of the thorax, two inches to the left of the spine, and on a level with the nipple, penetrated, and lodged within the chest He was treated in the field hospital of the 2d division, Twentieth Corps, and on June 4th, sent to No. 1 Hospital, Nashville. On June 7th, he was transferred to Totten Hospital, Louisville, and on June 24th, to Camp Dennison Hospital, Ohio, whence he was transferred to the Veteran Reserve Corps on November 29th, 1864. Discharged from service on July 26th, 1865. Pension Examiner Adams Jewett states that he examined Fouts, August 26th, 1865, and "noticed nothing abnormal on careful auscultation and percussion. Respiration 24. Pulse 93, and regular. Complained of occasional attacks of dyspnœa."

Case.—Private John Howard, Co. I, 148th Pennsylvania Volunteers, aged 35 years, was wounded at Gettysburg, July 2d, 1863; the missile struck the left hand near the palmar end of the third finger and passed out near the palmar end of the thumb; it then entered the chest two inches above the left nipple, passed through and lodged near the inferior angle of the left scapula. He was conveyed to the field hospital of the Second Corps, where he remained until the 15th, when he was transferred to McKim's Mansion Hospital, Baltimore. Cold-water dressings and poultices were applied to the wounds. On July 22d, the missile was extracted by Surgeon L. Quick, U. S. V. August 13th, wound of hand doing well; that of chest healed externally. He was transferred to Cuyler Hospital, Germantown, Pennsylvania, October 2d; to Camden Street Hospital, Baltimore, November 2d, and to the Veteran Reserve Corps, November 12th, 1863, with which corps he served until discharged from service on August 14th, 1865. The missile, an elongated smooth-bore ball, notched at the apex and compressed at the base, was forwarded to the Army Medical Museum, with a history of the case by the operator, and is represented in the adjoining wood-cut (Fig. 214). Pension ExaminerWilliam J. McKnight reports, September 5th, 1865, "the fingers are all crooked and deformed permanently, and the spine muscle injured; a bad case. Disability total." In March, 1872, the pensioner's name was on the rolls, his condition reported as little changed in the eight years succeeding his injuries.

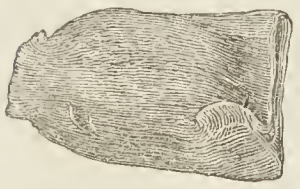

Fig. 214.—Ball extracted from soft parts near lower angle of left scapula. *Spec.* 1579, Sect. I, A. M. M.

The following abstracts relate to fatal perforations of the lung through intercostal spaces. In these it is to be regretted that the *post-mortem* appearances are not fully described:

Case.—Private John Vexter, Co. D, 98th Pennsylvania Volunteers, aged 40 years, was wounded before Petersburg, Virginia, June 7th, 1864, by a conoidal ball, which passed directly across the neck. He also received a gunshot fracture of the lower jaw, and a penetrating wound of the chest. He was taken to the hospital of the 2d division, Sixth Corps, and, on June 10th, was sent to Emory Hospital, Washington. The wounds were cleaned and iced-water dressings applied, with stimulants, expectorants, anodynes, and nourishing diet internally. When admitted, the patient was much exhausted from loss of blood and exposure; respiration difficult; pulse 83, and irritable cough and orthopnœa. By June 11th, the patient breathed easier and was able to lie down. The swelling was subsiding, and the wounds discharging slightly. He was unable to swallow anything except liquids. On June 13th, the breathing became more difficult, and, on the 14th, the wound of the chest commenced discharging slightly, blood and air passing from the orifice. Death resulted on June 15th, 1864.

Case.—Private Frederick Livinhagen, Co. B, 95th New York Volunteers, aged 25 years, was wounded at Petersburg, Virginia, April 1st, 1865, by a conoidal ball, which entered the left side and penetrated the lower lobe of the left lung anteriorly through the fourth intercostal space. He was treated in the field, at the hospital of the 3d division, Fifth Corps, in charge of Surgeon A. S. Coe, 147th New York Volunteers. There was hæmoptysis and some difficulty of respiration; but it was not urgent. The wound was left open for the escape of secretions. Afterwards there was considerable pneumonic inflammation. Demulcents, slight anodynes, and low diet, with absolute rest, constituted the treatment. His condition improving somewhat, and the hospital being overcrowded, the patient was placed on a hospital steamer, and, on April 10th, was sent to Armory Square Hospital, Washington. Pyæmia supervened, and death resulted on April 17th, 1865.

CASE.—Sergeant Daniel O'Shea, Co. K, 28th Massachusetts Volunteers, aged 29 years, strong and plethoric, received a penetrating wound of the thorax, by a musket ball through the third intercostal space, at Deep Bottom, Virginia, on July 27th, 1864. He had hæmoptysis, hurried respiration, anxiety of countenance, and sharp pain at the seat of injury. Simple dressings were applied at the field hospital of the 1st division of the Second Corps, and cool drinks, with a little morphia to quiet the harrassing cough, were prescribed. It was necessary to removed him by rail to City Point, whence he wassent to Washington by hospital steamer, and admitted to Lincoln Hospital on July 30th, 1864. Tonics, stimulants, expectorants, and arterial sedatives were administered; dry and wet cups and blisters were applied, and a nourishing diet was allowed. The patient died on the afternoon of August 11th, 1864, of pneumonia. At the autopsy, sixteen hours subsequently, a penetrating wound of the anterior surface of the upper lobe of the right lung was found; the heart weighed fifteen ounces and a half, and the cadaver was in such an advanced stage of decomposition that the dissection was not prosecuted farther. Acting Assistant Surgeon H. M. Dean reports the case.

CASE.—Private B. A———, Co. D, 151st Pennsylvania Volunteers, aged 19 years, was wounded at Gettysburg, July 2d, 1863. A ball passed through the left wrist and another through the upper part of the left lung. He was admitted to the field hospital at Gettysburg, and, on July 9th, transferred to McKim's Hospital, Baltimore. He was placed on full diet, with ale and ten drops of tincture of sesquichloride of iron thrice daily. The wound of the wrist becoming unhealthy in character, necessitated amputation of the forearm at the middle third. On August 31st, the patient was taken with pyæmic symptoms, and was ordered cinchona, with beef tea and milk-punch. On September 1st, the general condition was much worse, and the exhalations from the lungs and skin were very offensive. The stomach was irritable, and vomiting was not arrested by the administration of morphia in small doses, lime-water, etc. The patient continued to sink, and death occurred on September 6th, 1863. The perforated portion of the lung was contributed to the Army Medical Museum, with this history, by Medical Cadet W. H. Bradley. (See FIG. 215.)

FIG. 215.—Portion of the left lung perforated by a bullet. *Spec.* 17.8, Sect. I, A. M. M.

The two following examples of collapse of the lung after gunshot perforation, presented the usual phenomena of extreme dyspnœa, feeble pulse, pallor of countenance, clammy skin, inability to lie on the sound side, absence of respiratory murmur and alteration of the percussion sounds on the wounded side:

CASE.—Private Joseph Barnham, Co. A, 125th New York Volunteers, was admitted to McKim's Mansion Hospital, Baltimore, July 9th, 1863, with a gunshot penetrating wound of the chest, received at Gettysburg on the 3d. The ball entered the cavity of the thorax on the right side between the third and fourth ribs, about three inches from the median line. When admitted, he was in a state of delirium. He suffered with dyspnœa and severe pain in the chest, unattended by cough or hæmoptysis. Being unable to partake of nourishment, he sank rapidly, and died on July 12th, 1863. At the necropsy the cavity of the thorax, right side, contained about four quarts of sero-purulent fluid. The right lung was closely compressed against the vertebral column and completely solidified. The middle lobe was perforated by the ball, which was found lying loose in the lower part of the thorax within the pleura. The costal and pulmonary pleura showed evident marks of inflammation. The missile, a conoidal ball, with one side of the body obliquely flattened and grooved, was forwarded, with a history of the case, by Surgeon Lavington Quick, U. S. V. See (FIG. 216.)

FIG. 216.—Conoidal musket-ball flattened by impact on bone *Spec.* 2643, Sect. I, A. M. M.

FIG. 217.—Slightly contused rifle ball. *Spec.* 4463, Sect. I, A. M. M.

CASE.—Private Henry J. Ricker, Co. H. 10th Maine Volunteers, was wounded at Cedar Mountain, Virginia, August 9th, 1862, by a round ball, which entered two inches below the right acromion, passed between the second and third ribs, through the base of the right lung without injuring the large vessels, and lodged against the body of the vertebra just above the diaphragm. On the 12th, he was admitted to Fairfax Street Hospital. On admission, there was severe dyspnœa. Death resulted on August 17th, 1862. The necropsy revealed the course of the ball; the right lung was found to be completely collapsed and the pleural sac contained one hundred and twenty ounces of bloody fluid. The missile, represented in the wood-cut (FIG. 217), with a history of the case, was forwarded by Acting Assistant Surgeon James Robertson.

The next case illustrates the hazard attending too diligent explorations of the wound of the lung, a danger familiar to the practical surgeon, but often disregarded by the inexperienced. Mr. Poland* justly denounces such manipulative examinations as "perfectly unwarrantable, being attended with highly dangerous results, by disturbing nature's efforts to effect a repair, disarranging the clot, and exciting irritation and inflammation; a proceeding, only tending to gratify curiosity, without the slightest benefit to the patient."

* *On Injuries of the Chest*, in Holmes's *System*, *op. cit.* Vol. II, p. 579.

CASE.—Private Albert M. Carley, Co. H, 111th New York Volunteers, aged 18 years, was wounded at Petersburg, at the general assault, April 2d, 1865, by a conoidal ball, which entered the left side near the spine, between the eighth and ninth ribs, penetrated the thorax, and lodged. He was taken from the field and sent by rail, with over two hundred other wounded of the corps, to City Point, to the field hospital of the Second Corps, under Acting Staff Surgeon John Aiken, U. S. V. He had rallied from the shock of the injury, but was depressed by hæmorrhage, and had labored breathing and hæmoptysis. Simple dressings were applied, and the patient was placed on an hospital steamer, and on April 5th was admitted to Armory Square Hospital, Washington. He died on April 6th, 1865, while the wound was being examined.

CASE.—Private Leonidas Miller, Co. A, 26th Iowa Volunteers, was wounded at the battle of Big Shanty, Georgia, June 16th, 1864, the missile passing through the upper portion of the middle lobe of right lung, entering between the fourth and fifth ribs anteriorly, and lodging in the pleural cavity. He was admitted on the same day into the field hospital of the 1st division, Fifteenth Corps, in charge of Surgeon M. W. Robbins, 4th Iowa Infantry. There was profuse hæmorrhage, with greatly oppressed breathing, inability to lie in a recumbent posture, or on the sound side, with feeble pulse. The bleeding was arrested by cold applications to the chest, and opiates were given. In spite of supporting treatment he failed gradually, and was transferred to the general hospital, Fifteenth Corps, at Barton's Iron Works, Georgia, on June 29th. On admission, the patient was much emaciated and had a large bed-sore in the sacral region; his countenance was pale and expressed great anxiety; breathing was difficult and attended with excruciating pain; pulse 120; the wound presented externally the usual healthy appearance. Stimulants and anodynes were administered, simple dressings applied to the wound, and a generous diet ordered. The patient died on July 3d, 1864. The case is reported by Surgeon J. C. Hilburn, 97th Indiana Volunteers.

CASE.—Private Francis Smith, Co. K, 46th Ohio Volunteers, was wounded at the battle of Kenesaw Mountain, June 27th, 1864, by a conoidall ball, which entered the left chest, penetrated the fourth intercostal space near the nipple, passed through the lung, and made its exit between the sixth and seventh ribs, close to the spinal column. He was received into the field hospital, Fifteenth Corps, at Barton's Iron Works, Georgia, on June 30th. On admission, the patient was suffering severely. His wound was dressed and an opiate given, after which he rested well for the remainder of the day. The same treatment was followed from day to day, giving him enough opium to control the pain, but he continued to sink gradually, and died on July 14th, 1864. Acting Assistant Surgeon R. H. McKay, who reports the case, says: "In this case the patient did not seem to rally at any one time, and for a great portion of the time, during the last week, he was delirious."

CASE.—Private Jesus Garcia, Troop F, 1st New Mexico Cavalry, in attempting to escape, after being apprehended as a deserter at Cubero, New Mexico, on October 10th, 1865, was wounded by a conoidal ball from a Remington pistol, which entered the right breast, one inch below and somewhat to the left of the nipple, passed directly through, and emerged at the inferior angle of the scapula. Another ball passed through the soft part of the outer portion of the left thigh. He was admitted to hospital at Fort Wingate. The symptoms were excessive dyspnœa and high fever. The treatment pursued was strictly antiphlogistic, and the patient was kept recumbent, with the shoulders slightly elevated. He died on October 13th, 1865. The ball had passed through the middle lobe of the right lung, making its exit through the seventh intercostal space. The case is reported by Acting Assistant Surgeon R. H. Longwill.

Gunshot Fractures of the Clavicle.—This form of injury was usually complicated by wounds of the lung, or by fractures of the ribs or scapula, or by injuries of arteries or nerves, and the complications were frequently the most important elements of the case. A nearly uncomplicated case of gunshot fracture of the clavicle, with recovery, is detailed on page 474, all of the varieties of fracture observed in long bones are met with in clavicle. The following is an interesting example of transverse fracture:

CASE.—Sergeant Samuel A———, Co. F, 125th Pennsylvania Volunteers, aged 40 years, was wounded at Chancellorsville, Virginia, on May 3d, 1863, and was admitted to Carver Hospital, Washington, on the 9th. A bullet wound was found on the right side of the back, near the spine, and in the neighborhood of the third dorsal vertebra. There was a fracture of the clavicle on the same side, with considerable swelling, and some deformity of the shoulder. The patient had frequent cough, and bloody expectoration. The fracture of the clavicle was treated by a pad in the armpit and a sling, and the wound in the back was dressed with wet lint covered with oiled silk. Small doses of morphia were given, with the effect of diminishing very much the frequency of the cough. The patient was feeble, and the discharge from the wound considerable, but no very serious symptoms presented themselves until the 16th, when the patient was seized with considerable oppression of breathing, and with pain on the wounded side. Dullness over the upper side of the right lung was observed on percussion. A discharge of blood and serum from the wound seemed to relieve the pneumonic symptoms in a few hours after their first occurrence. The breathing became easier, and pain was no longer complained of. Bleeding from the wound ceased on the 17th, but a copious discharge of serous pus remained, and the patient became gradually weaker, notwithstanding the free use of stimulants and of as much nourishment as could be administered. His sinking was slow but constant, and he died on the afternoon of May 20th. At the autopsy, the bullet was found just below the clavicle, near its middle, having fractured the bone transversely after passing between the third and fourth ribs, and fracturing the neck of the third near its angle. The specimen figured in the adjoining cut (FIG. 218), was presented to the Army Medical Museum, with the above account, by Acting Assistant Surgeon B. F. Craig.

FIG. 218.—Transverse fracture of the right clavicle, with a conoidal bullet attached. *Spec.* 1210, Sect. I, A. M. M. (Vertical view. Reduced to one-third.)

Case.—Private Andrew G———, Co. I, 5th Michigan Volunteers, aged 21 years, was wounded at Fredericksburg, December 13th, 1862, by a missile, which fractured the clavicle, passed through the apex of the right lung, and emerged near the eighth dorsal vertebra. He was admitted to Harewood Hospital, Washington, on December 17th, suffering from traumatic pneumonia, the more formidable symptoms of which appeared to be relieved after venesection, and the administration of tartar-emetic and morphia. On January 1st, irritative fever, chills, profuse sweating, and vomiting set in, attended with hæmorrhage and fœtid suppuration from the wound to the amount of four ounces. A compress and bandages were applied; stimulants and tonics administered. This hectic condition continued, with brief periods of amendment, till January 7th, 1863, when death occurred. The case is reported by Surgeon Thomas Antisell, U. S. V.

In the following case of gunshot fracture of the clavicle, there appears to have been little, if any, direct lesion of the lung. Hospital gangrene, which was the scourge of the Nashville hospitals at the time, gave the *coup-de-grace*, as it were, at the end of sixteen weeks:

Case.—Sergeant *Lemuel A. J. B*———, Co. I, 27th Mississippi Regiment, aged 22 years, was admitted to hospital at Nashville, on January 27th, 1864, from another hospital, for a gunshot fracture of the clavicle, which was thought to be united. The wounds of entry and exit being nearly healed, and the patient doing well, nothing more than simple dressings were required. On February 11th, the patient had a severe chill, followed by fever, cough, and pain in the chest, for which quinine and whiskey were prescribed. On the 13th, pneumonic symptoms setting in, treatment was directed to their relief. On the 15th, the wound became re-inflamed and gangrenous. On the day following, the patient being very restless and suffering much from his wound, ether and chloroform were administered, and bromine in full strength applied. He rallied slowly, reaction being rather imperfect. Becoming more exhausted and restless, he died on the afternoon of the 17th. The specimen was contributed to the Army Medical Museum, with the history, by Acting Assistant Surgeon R. T. Higgins, and is figured in the adjoining cut (Fig. 219) [This patient was, probably, wounded at Mission Ridge, November 25th, 1863, as he was received at Nashville from the hospital for prisoners at Stevenson, Alabama, December 11th, 1863. A musket ball had entered at the junction of the outer with the inner two-thirds of the left clavicle, had passed downward, inward, and backward, emerging between the scapula and spine, probably injuring the pleural cavity, though the diagnosis was not made out positively. The lung trouble was mainly secondary.]

Fig. 219.—Left clavicle, showing a partially united fracture with shortening, posterior displacement, and necrosis. *Spec.* 2194, Sect. I, A. M. M.

Case.—Private *W. H. C*———, Co. H, 31st Georgia Regiment, wounded at Fredericksburg, December 13th, 1862, was admitted to Carver Hospital, Washington, and died exhausted on January 8th, 1863. A conoidal musket ball had entered the back on the left side, about three inches from the point of the acromion process, penetrated the spine of the scapula just below the crest, passed inward and forward, and fractured the clavicle at the point where the conoid ligament is attached. From this point, its course was traced behind the large blood vessels of the neck and between the œsophagus and spinal column. Here an abscess was formed which reached upward five or six inches along the spine and downward in the mediastinum to the bifurcation of the trachea, where the ball was found point downward and resting against the right bronchial tube. An opening was found communicating with the abscess and the right pleural cavity. The track of the ball and the large abscess were filled with pus, and clots of blood undergoing putrefaction. Portions of the left scapula and clavicle were contributed to the Army Medical Museum, with the above account, by Surgeon O. A. Judson, U. S. V. The specimen is partly represented in the adjoining cut (Fig. 220).

Fig. 220.—Conoidal musket-ball, with a portion o the left scapula, which it has perforated. *Spec.* 636, Sect. I, A. M. M.

Case.—Private Edward Osborn, Co. H, 9th Pennsylvania Reserves, aged 24 years, was wounded at South Mountain, Maryland, September 14th, 1862, by a conoidal ball, which entered the right side between the clavicle and first rib, passed through the upper portion of the lung, and emerged at the lower border of the scapula. He was taken to a farm-house and thence to Middletown, where he remained until October 1st, when he was sent to Hospital No. 3, Frederick. On January 24th, 1863, he was transferred to Hospital No. 1. When admitted, he had a severe cough; pulse 88, but weak. Patient very much emaciated and tongue furred. Stimulants, tonics, and expectorants were administered. January 26th: Abscess formed on posterior aspect of right arm, which was opened, evacuating about three ounces of pus. January 30th: During attempts to cough, pus escapes freely from the wound. Expectoration copious but diminishing, and sometimes streaked with blood. February 5th: Slowly improving. When coughing, air passes through the anterior wound, and pus through the posterior one; discharge profuse but healthy. Cough worse when laying down and at night. February 10th: Expectoration diminished; air has ceased to pass through the wound. He continued to improve, and, by February 15th, was able to move about the ward. Wound looking healthy and suppurating freely. On March 30th, a piece of bone about the size of a hazel-nut came away from the clavicle, which had been splintered by the ball. April 18th: Right lung almost consolidated, and sinking away of chest very noticeable. He was transferred to Baltimore, and finally discharged from service on November 12th, 1863 Pension Examiner E. McCook

reports, November 18th, 1863, "arm useless, fingers partially paralyzed. Air still passes out of the posterior opening from the lung." The Pittsburg Examing Board reports, October 4th, 1871: "Gunshot wound of clavicle and lung, in consequence of which his arm and hand are almost useless, his body emaciated and feeble. Disability total and permanent; no evidence of vicious habits." He was last paid on March 4th, 1872.

A case of fracture of the clavicle associated with fractures of the transverse processes of the cervical vertebra is related at the foot of page 431.

The Army Medical Museum contains twenty-one specimens of gunshot fractures of the clavicle. Besides those noted in the text, consult. for appearances in recent fractures of sternal and middle portions, *Specs.* 1644 and 2984, and of outer third, *Spec.* 3460, Sect. I; for necrosis, *Spec.* 2193; for oblique fracture, with attempt at union, *Specs.* 309, 3737; for longitudinal fracture, *Spec.* 137.

FIG. 221.—Gunshot perforation of the right scapula. *Spec.* 851, Sect. I, A. M. M.

Gunshot Fractures of the Scapula.—Several illustrations of this injury have been cited among the non-penetrating gunshot wounds of the chest (p. 475). But the scapula is more frequently injured in penetrating wounds of the thorax, and especially in antero-posterior perforations. A good example of the latter injury is shown by the wood-cut (FIG. 221):

Case-shot, passing from before backward through the right chest, have shattered the upper part of the right scapula. There are two perforations of the lower plate, near its middle, connected by a fissure. The supra-spinous fossa has been chiefly carried away. The thin splintered laminæ of the body of the bone are forced outward about the perforations. The specimen was contributed by Surgeon Jerome B. Green, 1st Rhode Island Volunteers. It was brought from the First Bull Run battle-field.

Starred fractures of the body of the shoulder-blade were produced by balls entering perpendicularly from without or, in about equal proportion, by those emerging from the chest or axillary fossa. Projectiles impringing laterally or obliquely caused longitudinal or grooved fractures, with fissures limited usually by the spine or thick border. Forms of fracture of the neck, processes, and spine, seldom or never occurring from other external violence, are not infrequent after gunshot. Thus perforations of the spine, fracture of the coracoid, and of the neck close behind the glenoid cavity, are not rare. Secondary hæmorrhages from the trunk or minor divisions of the transversalis colli, suprascapular, posterior cervical, princeps cervicis, and subscapular were sometimes very troublesome, the inosculations of these branches of the carotid, subclavian, and axillary perplexing the operator, and occasionally leading him in desperation to tie a vessel of the first order. Lodgement of foreign bodies beneath the scapula, and accumulations of blood and pus were more frequent and fatal complications in those cases, and it is feared that lives were lost, perhaps, from lack of boldness in their removal or evacuation.

CASE.—Private John F. Scites, Co. H, 5th West Virginia Volunteers, aged 21 years, was wounded at Winchester, Virginia, July 24th, 1864. The missile fractured the first and second ribs, left side, passed backward, and slightly downward and inward, fractured the third rib about one inch external to the tubercle, and passed through the scapula at its inner border, near the middle. He was taken prisoner and retained until September 26th, when he was sent to St. John's College Hospital, Annapolis. He was transferred, on October 6th, to Camp Parole, whence he was discharged from service on October 7th, 1864. Pension Examiner William Owens reports, May 15th, 1866, "there is an aneurism of the left subclavian artery through the space left by the loss of portions of the first and second ribs. The left arm and shoulder are quite weak." Examining Surgeon Jonothan Morris, Ironton, Ohio, reports, March 1, 1867, that "upper portion of the left lung is injured; the ball passed through left lung and left scapula; shoulder weak, and forward motion of arm painful. Disability one-half; duration one year."

CASE.—Private *W. Oglesby*, Co. H, 38th Georgia Regiment, aged 35 years, having been wounded at Fredericksburg, December 13th, was sent to Richmond, and admitted into Chimborazo (Confederate) Hospital on December 15th, 1862. A missile had entered the right breast between the first and second ribs, passing entirely through the lung and lower portion of the

scapula. When admitted, the prognosis was unfavorable, the patient having lost a considerable amount of blood from the lungs, and being much prostrated. He rallied under treatment, which consisted of free bleeding from the arm and the antiphlogistic regimen generally, followed by liberal doses of tincture of iron. The wound assuming a healthy appearance, soon healed, and, on December 28th, the patient was almost entirely recovered. He was furloughed.

The next case is from a prisoner wounded at Fort Donelson, February 15th, 1862. He was 23 years of age, and temperate. A musket ball entered below the right clavicle and passing inward and backward injured the upper lobe of the lung and fractured the scapula (FIG. 222):

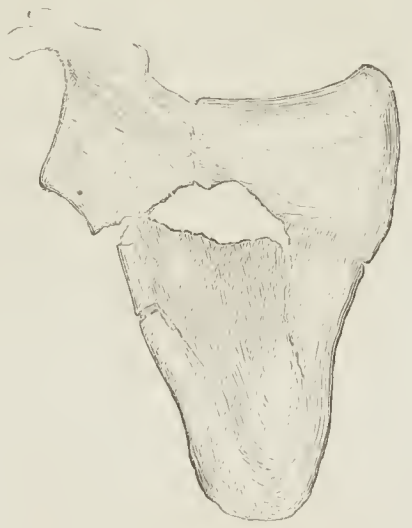

FIG. 222.—Gunshot fracture of the right scapula. *Spec.* 286, Sect. I, A. M. M.

The patient survived the injury until after August 21st, 1862, when he was sent to the prison hospital at Alton, Illinois. In the specimen, a transverse fracture extends across the dorsum, parallel with the spine. From this a vertical fracture separates the superior anterior fourth from the remainder of the bone. A longitudinal fracture occupies the anterior border for one inch below the chief injury, and a fissure of similar length extends parallel to the posterior border. There are traces of periosteal disturbance. The specimen was contributed to the Army Medical Museum by Surgeon J. T. Hogden, U. S. V.

CASE.—Private G. W———, Co. E. 96th New York Volunteers, aged 24 years, was admitted to hospital at Philadelphia from Winchester, Virginia, on October 26th, 1864, for a gunshot fracture of the left scapula, received at the battle near Cedar Creek on October 19th. A conoidal musket ball had entered the left shoulder, just beneath the acromion process of the left scapula, passed transversely downward beneath the scapula, and imbedded itself just beneath its spine. The wound was quite unhealthy, the shoulder being enormously swollen and discolored, with a large amount of pus concealed beneath the scapula. The patient's breathing was oppressed; there was dullness on percussion, with absence of the vesicular murmur over the upper portion of the left lung, and the general health was much impaired. The expectant plan of treatment was pursued. On October 27th, the patient was etherized, and the ball removed through a counter opening beneath the inferior border of the scapula. Some eight or ten ounces of very unhealthy pus and broken bone were evacuated at the same time. In the afternoon a severe chill occurred, followed by slight fever, profuse, cold, clammy perspiration, and low muttering delirium. Ten grains of bisulphite of soda, in an infusion of quassia, was directed to be taken every hour, in addition to tonics and stimulants. Delirium and chills continued on the 28th, with an increase of swelling and disorganization of the soft parts. On the 29th, none of these symptoms had abated. The patient sank rapidly, and died on the morning of October 30th, 1864. The autopsy revealed a bad fracture of the scapula, a disorganized condition of the subscapular and pectoral muscles, and an opening in the apex of the chest. The left lung was highly congested; the abdominal viscera healthy. There was congestion of the membranes of the brain, with effusion of serum at its base and in the ventricles. The pathological specimen was contributed to the Army Medical Museum, with the history, by Acting Assistant Surgeon A. A. Smith. (See FIG. 223.)

FIG. 223.—Left scapula, showing fracture of the coracoid process. *Spec.* 3638, Sect. I, A. M. M.

Gunshot fractures of the scapula were often associated with those of the ribs and humerus, as in the following case:

FIG. 224.—Gunshot fracture of the humerus scapula, and ribs *Spec.* 1215, Sect. I, A. M. M.

CASE.—Private Thomas L———, Co. K, 1st Massachusetts Volunteers, aged 42 years, having been wounded at Fredericksburg, Virginia, on May 3d, 1863, was sent to Washington, and admitted to Carver Hospital on the 9th. An unknown missile had entered the right shoulder about two inches below the acromion process, and, passing backward and inward, had emerged above the inferior angle of the scapula. The patient's pulse was 120, and quite weak, and his skin was bathed in perspiration. Percussion over the right lung elicited considerable dullness. The treatment consisted in the frequent administration of anodynes, stimulants, and tonics, with a low diet. The patient suffered from anorexia and insomnia, and bloody serum was discharged through the posterior wound during inspiration. Air was also forced through at the same time. He died on the morning of the 11th. The autopsy discovered a fracture at the surgical neck of the humerus; the sixth, seventh, and eighth ribs were comminuted, and portions of bone were forced through the pleura, the cavity of which contained a large quantity of bloody serum. The scapula was also fractured, and the tissues surrounding the wound were much inflamed. The costal surface of the pleura was coated with fibrinous exudations. The pathological specimen, consisting of the right scapula, upper third of the humerus, and sections of the fifth, seventh, and eighth ribs, was contributed by Surgeon O. A. Judson, U. S. V., and is represented in the wood-cut (FIG. 224).

In other instances the clavicle, scapula, and ribs were shattered by the same projectile, as in the case of Private J. M. W———, illustrated by *Spec.* No. 1304 of the Museum; that of Private W. A. F———, narrated on page 475, and in the following case:

CASE.—Private Edward L———, Co. A, 87th New York Volunteers, was wounded at Bull Run, August 27th, 1862, by a conoidal musket ball, which struck the left clavicle about three inches from its sternal extremity, passed through the chest, and emerged near the posterior border of the left scapula. Five days subsequently he was admitted into the Cranch Hospital at Washington, in a feeble condition. There was constipation and troublesome cough accompanied by hæmoptysis. The bowels were relieved by sulphate of magnesia, and the cough was alleviated by ipecac and opium. An engorged condition of the injured lung, with sanguineous expectoration and dyspnœa, continued for some twelve days, when the patient began to grow better. His general health improved, and, to all appearance, resolution was taking place in the lung. Improvement continued till October 12th, when the patient took cold through indiscretion, and had a chill. After appropriate treatment he had partially recovered by October 27th, when he again exposed himself unnecessarily, took a fresh cold, and had another chill, lasting an hour and a half, followed by fever and pneumonia of the right lung. Wet cups were now applied, and a dose of ten grains of calomel was administered. On October 30th, the cups were repeated, and another expectorant mixture was prescribed. There was no reaction, however, dyspnœa continuing unabated, and terminating in death on November 3d, 1862. The autopsy showed the left clavicle fractured at the junction of the middle with the outer third, the distal portion being driven in. There was a formation of callus, but no union of bone. The third, fourth, and fifth ribs, of the left side, were fractured near their spinal articulations, and the dorsum of the left scapula was perforated. The apex of the left lung was grooved by the passage of the ball and appeared entirely solidified. The track of the wound through the lung was entirely cicatrized, and seemed cartilaginous to the touch. There were also pleuritic adhesions in the right side, and the right pleural cavity contained from two to three pints of fluid. The specimen, represented in the adjoining wood-cut, FIG. 225, was contributed to the Army Medical Museum, with the history, by Surgeon A. Wynkoop, U. S. V.

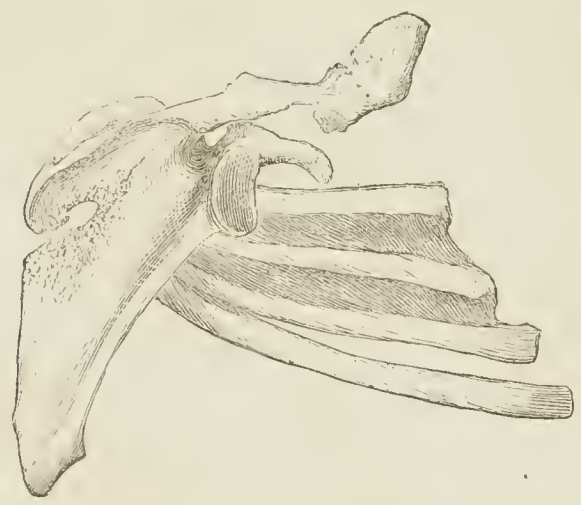

FIG. 225.—Left scapula, clavicle and ribs fractured by a conoidal musket ball. *Spec.* 245, Sect. I, A. M. M.

Gunshot fractures of both scapulæ by the same ball are occasionally seen. In such instances the projectile, passing parallel to the posterior plane of the thorax, usually fractures one or more vertebral spinous processes, as in the case of Private J. T. L———, Co. G, 18th Massachusetts Volunteers, recorded on page 435; see *Spec* 639 of the Surgical Section of the Army Medical Museum. The specimen of fractured vertebræ is No. 843 of the same section. Cases of fractured scapula complicated by injuries of the vertebræ have been reported in the last chapter; see cases of Corporal G. W. M———, p. 438, FIG 190. The scapula is *Spec.* 3089, Sect. I, of the Museum. Also, the case of Sergeant J. H. R———, page 431, and that of Private C B———, *Spec.* 4092, Sect. I. The Museum possesses thirty-two specimens of gunshot fracture of the scapula. Besides those that have been cited, or that will be noted in the section on operations, interesting illustrations of attempt at reparation in the scapula are afforded by *Specs.* 2792, 2186, 1211, from patients who survived their injuries thirty-three, sixty-three, and twenty-two days, respectively. *Specs.* 832, 2585, 2124, and 4862 show various forms of associated fractures of the shoulder-blade and ribs.

Gunshot Penetrating Fractures of the Sternum.—A number of examples of recovery after this severe form of injury were reported.* One of the most interesting is that represented in the accompanying chromolithograph (PLATE X) of a soldier wounded in the anterior mediastinum in General Sedgwick's movement, at the battle of Chancellorsville:†

CASE.—Private Charles P. Betts, Co. I, 26th New Jersey Volunteers, aged 22 years, was struck by a three-ounce grape-shot, on the morning of May 3d, 1863, in a charge upon the heights of Fredericksburg. The ball comminuted the sternum, at

* For instances of non-penetrating gunshot fractures of the sternum, see page 474, *ante*.

† The drawing was made at the Potomac Creek Hospital of the 2d division, Sixth Corps, and so faithfully was the likeness of the patient preserved, as well as the features of the wound, that Surgeon S. A. Holman, U. S. V., medical director of the Sixth Corps, in 1865, turning over a portfolio at the Surgeon General's Office, and, observing this drawing, exclaimed: "I know that man; that 's Betts, 2d division, Sixth Corps!"

PENETRATION OF ANTERIOR MEDIASTINUM BY CANISTER

the level of the third rib, on the left side, and tore through the costal pleura. It remained in the wound and was removed by the patient. On the following day, Betts entered the hospital of the 2d division of the Sixth Corps. Through the wound, the arch of the aorta was distinctly visible, and its pulsations could be counted. The left lung was collapsed. When sitting up there was but slight dyspnœa. Several fragments of the sternum were removed, and the wound soon granulated kindly. On May 10th, a colored drawing of the wound was made. (No. 19, Surgical Series of Drawings, S. G. O.) On July 5th, the patient was transferred to Washington, convalescent. He ultimately recovered perfectly. This man was discharged the service on June 27th, 1863, and was subsequently pensioned, his disability being rated three-fourths and permanent. On April 5th, 1864, Pension Examiner L. A. Smith reports that the injured lung "still continues defective somewhat, causing dyspnœa." The following is an extract from the patient's letter, dated Newark, New Jersey, April 22, 1872, in reply to an inquiry regarding his condition: "My wound is not what you would call a running sore exactly, but still there is all the while a kind of dry scab forming and coming off one after the other, and it is very tender. I have spoken to several doctors about it, and they say that it will always be so on account of the bone being broken in such a way that it is ragged and does not heal solid. My health is as good as I ever expect it to be again. My left lung is a very delicate thing, and the least cold seems to go right to it, and the weather we have here at this season of the year is very rough on me; but I suppose there is no use of crying over spilt milk, but must only try to make the best of a bad job."

Case.—Private P. H. B———, Co. C, 147th Pennsylvania Volunteers, was wounded at Chancellorsville, May 2d, 1863, by a conoidal musket-ball, which entered between the second and third ribs, on the right side, two inches from the median line, fractured the sternum, and lodged beneath it. The wound bled profusely, but the hæmorrhage was arrested by pressure. The patient was conveyed to Douglas Hospital, Washington, on May 8th, and died the following day. He had hæmoptysis and the symptoms of traumatic pneumonia. The pathological specimen, contributed to the Army Medical Museum by Assistant Surgeon W. Thomson, U. S. A., is figured in the adjoining wood-cut (Fig. 226.)

Fig. 226.—Superior portion of sternum fractured by a ball which is attached. *Spec.* 1073. Sect. I, A. M. M.

Case.—Private H. B——, 27th Michigan Volunteers, aged 21 years, was wounded at Spottsylvania, May 12th, 1864, by a fragment of shell, which contused the upper anterior portion of the chest without lesion of the integument. He was admitted to Fairfax Seminary Hospital on the 16th; there was a large tumor at the point of injury and extensive suggillation. Cold-water dressings were applied, and extra diet allowed. On the 17th, the tumor was evacuated by an incision, leaving a cavity some two inches in diameter. The patient did extremely well under the administration of quinia in small doses, and an extra diet, until June 15th, when there was anorexia, dry tongue, an apparently healthy discharge from the wound, troublesome cough, and muco-purulent sputum. To combat these symptoms, tonics, stimulants, and an extra diet were directed. The patient sank gradually, and, by July 5th, complained of great pain in the lower part of the abdomen. There was also difficulty in micturition, which lasted five days. On the 10th, there was difficulty in speaking; great dyspnœa; respiratory murmur around the wound, and pulse varying from 100 to 110. This was followed by coma, and the patient died on the 15th. The autopsy revealed a fracture of the sternum—small pieces of the manubrium being driven in—with two apertures in the bone communicating with the lung. There was a large abscess in the left lung, with evidences of extensive pleuritis and effusion in the pleural cavities. The remaining organs exhibited nothing worthy of remark. The pathological specimen is carious within to a considerable extent, and, on the internal surface, is partly covered with a plate of new deposit. It was contributed to the Army Medical Museum by Assistant Surgeon H. Allen, U. S. A., and is figured in the adjoining cut (Fig. 227).

Fig. 227.—Upper portion o the sternum fractured longitudinally and obliquely, with displacement. *Spec.* 2914, Sect. 1, A. M. M.

Case.—Private Edwin Steele, Co. A, 3d Missouri State Militia Cavalry, aged 23 years, was wounded at Caledonia, Missouri, September 13th, 1864, by a round ball, which entered through upper part of sternum, passed backward, and lodged under the left scapula. He was treated at Caledonia until October 11th, when he was sent to the post hospital at Cape Girardeau. Discharged from service February 27th, 1865. Pension Examiner E. W. Bartlett reports, June 22d, 1869, "the missile interferes with the motion of the arm and causes hæmorrhage of the lungs. Is unable to labor and not likely to improve." He was still a pensioner in March, 1872.

Case.—Private George W. Edkin, Co. D, 12th Michigan Volunteers, aged 27 years, received a gunshot penetrating wound of the chest, at Shiloh, April 7th, 1862. The missile entered through the centre of the sternum, passed through the mediastinum, and lodged beneath the posterior border of the left scapula. He was taken to the field hospital, where the wound was dressed with adhesive plaster. During the first twenty-four hours, the external hæmorrage was profuse, and air passed through the wound for three days. Three days after the reception of the injury, the ball was extracted by Surgeon R. C. Kedzie, 12th Michigan Volunteers. The internal hæmorrhage was considerable and frothy, and bloody expectoration continued for some three weeks. Morphia was administered regularly, and the patient was kept upon a light diet; stimulants were prohibited. During three months the sputa were bloody, gradually lessening but not entirely ceasing for more than a year. He was removed to the Infirmary Hospital, Pittsburg. The wound finally healed about the middle of July, 1862. He was discharged from service on November 7th, 1862. Pension Examiner Ira C. Backus reports, December 1st, 1863, that "there is permanent lameness of the left shoulder." Dr. M. Gill, in a letter to this office, dated March 26th, 1866, says that "the track of the ball is tender; constant pricking pain through the lungs; dyspnœa increased by exercise. Severe coughing excited by fatigue or cold produces hæmoptysis. Does not have constant cough. Cannot lie upon either side long at once; more difficult upon left, easiest upon the back, requires frequent change of position, but at all times needs to lie with his head elevated.'

Case.—Private James Brownlee, Co. G, 134th New York Volunteers, aged 21 years, was wounded at Gettysburg, July 1st, 1863, by four balls and three buckshot. One ball, probably conoidal, entered the sternum about an inch below the jugular fossa, and passing downward and outward, underneath the second, third, and fourth ribs, perforated the upper lobe of the right lung superficially, and emerged between the fourth and fifth ribs, about three inches to the right of the nipple of the same side. Three buckshot took effect just above the pubes, some of them passing through the bladder. One ball entered the right thigh and lodged; another (conoidal) entered the left thigh and passed nearly through. It was removed on the fourth day. A nearly spent conoidal ball entered the back of the sacrum, near its middle, and buried itself slightly beneath the skin, whence it was immediately removed by the patient. In addition to the injuries already stated the patient affirms that he was finally struck upon his knapsack, and knocked down by a piece of railroad iron about eighteen inches long, which was fired from one of the enemy's guns. Being made a prisoner soon after, a Confederate surgeon removed some fragments of the sternum from the wound of exit, and dressed the wound with pledgets of lint, removing them every hour or two. He observed that whenever the dressing was removed he breathed with difficulty, but on being replaced he felt immediate relief. The patient was admitted to Camp Letterman, Pennsylvania on August 6th, and was furloughed on October 30th, 1863. He was admitted to Central Park Hospital, New York, on December 9th, 1863, and came under the observation of Professor Frank H. Hamilton, who stated that "after the lapse of nine months there is a copious purulent discharge from both orifices, and the walls of the thorax upon the injured side have already contracted considerably. The posterior portion of the right lung admits air freely, nearly to its base. In front, no auscultatory sounds are detected. When he stands erect the right shoulder falls considerably. Most of the time he has a troublesome diarrhœa, yet under a generous diet he is gradually gaining in strength and health." On June 3d, 1865, Brownlee was admitted to Ira Harris Hospital, Albany. He was discharged the service on August 12th, 1865. Examining Surgeon William H. Craig states, August 22d, 1866, that "a fistulous opening remains in the breast, at which the air escapes in inspiration. About four ounces of pus is discharged from this opening each day. Disability probably permanent." On January 29th, 1867, Examining Surgeon E. S. Delavan, at Albany, reports: "Three buckshot entered in front near the symphisis pubis, perforating the bladder. Strange to say, he recovered from the wound. Ball entered the breast and sternum and passed out (probably, though he never saw the ball); it may be in the chest below the right nipple. The right lung is almost totally useless. I can detect no respiratory murmur, and he has cough and feeble pulse. In my opinion, the disability is permanent."

Gunshot Fractures of the Ribs.—The ribs are sometimes fractured, as has been seen (pp. 473–4), by balls that do not penetrate the chest cavity, but much more frequently by projectiles that penetrate or perforate. Surgeon J. H. Brinton, U. S. V., called the writer's attention, during the war, to the greater danger attending fractures at the point of entrance of the missile than those at the point of exit; and mentioned that, in a large series of chest wounds that he had observed, an unfavorable prognosis might be almost uniformly given when a ball struck a rib on entering, deflected inward the sharp points of the broken rib and drove before it bony spiculæ; whereas, if the projectile passed in through an intercostal space, and fractured the ribs on emerging from the thorax, far less apprehension need be felt. This is undoubtedly a very important practical distinction, and it has been fully justified by the facts reported:

Case.—Private C S———, Co. I, 14th Connecticut Volunteers, aged 22 years, was wounded in the chest at Morton's Ford, Virginia, on February 6th, and died with pleurisy on February 28th, 1864. He was struck on the anterior part of the left chest by a conoidal musket-ball which fractured the sixth and seventh ribs, two inches or more from the junction of the cartilages. The ball was slightly impacted and readily removed. It had, however, produced much splintering. The patient was conveyed to the hospital of the Second Corps, at Brandy Station, under charge of Surgeon Frederick A. Dudley, 14th Connecticut Volunteers. There was hæmoptysis, dyspnœa, and great prostration. The accessible fragments of bone were removed, and other foreign bodies, and the hæmorrhage being suppressed, the wound was dressed with simple dressings. An expectant treatment was pursued, until symptoms of pneumonia appeared, when mild antiphlogistics and anodynes were resorted to. But pericardeal complications supervened, and, in three weeks the case terminated fatally. At the autopsy the substance of the lung was found to be slightly injured; there was great effusion in the cavity of the left chest and within the pericardium. The pathological specimen was contributed to the Army Medical Museum by Surgeon Justin Dwinelle, 101st Pennsylvania Volunteers. (See Figs. 228 and 229.)

Fig. 228.—Wet preparation of portions of four ribs, with the central ones fractured. *Spec.* 2119, Sect. I, A. M. M.

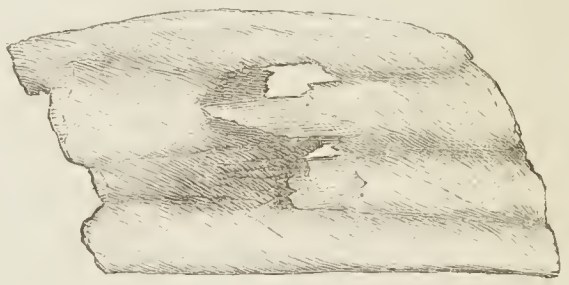

Fig. 229.—A posterior view of the same.

The next two abstracts refer to cases of partial recovery after perforation of the chest by balls, with fracture of the rib on exit from the cavity. The lung injuries were apparently slight in both instances:

CASE.—Private Melchior Breitel, Co. I, 12th New Jersey Volunteers, was wounded at Chancellorsville, May 3d, 1863, by a conoidal ball, which entered the lower lobe of the left lung, and lodged beneath the integuments of the opposite side, after fracturing the seventh rib near the sternum. He was sent to the field hospital, thence was admitted, on June 14th, to Point Lookout Hospital, Maryland, whence he was transferred to the Ward Hospital, New Jersey, on September 9th, 1863. Eight months after the reception of the injury the rib was found necrosed, and the wound still discharging pus; several fragments of bone had escaped from time to time; the patient's breathing was unembarrassed, and his general health good. This man was discharged the service on March 28th, 1864, and pensioned. The wound was still unhealed; but his general health was excellent. His disability was rated total and temporary. Eight years afterward, March, 1872, this pensioner is recorded as having received his pay; but no report is given of his state of health.

CASE.—Private Samuel McCalecher, Co. D, 3d Pennsylvania Reserves, was wounded at Bull Run, Virginia, August 28th, 1862, by a round ball, which entered two inches above the right nipple and lodged beneath the skin three inches below the inferior angle of the right scapula, comminuting the tenth rib in its exit from the chest cavity. He was treated in the field till September 3d, and then transferred to the Baptist Church Hospital, Alexandria. Bloody sputa occurred occasionally for two days after admission, and the patient suffered from pain in the right lower lobe on drawing a full breath. These symptoms soon ceased. On September 12th, slight crepitation was heard over the lower part of the right lung. On September 15th, Acting Assistant Surgeon George F. French extracted the ball from beneath the skin. The patient continued to improve, and by November 11th, was apparently well, with diminished respiratory murmur in the lower right lobe. He was discharged from service on December 1st 1862. The missile, which is irregularly and roughly battered, was forwarded to the Museum. It is represented in the wood-cut (FIG. 230). Pension Examiner H. M. Nagle reports, April 11th, 1867, that "the right lung is affected; has great pain, with weakness in chest, considerable cough and dyspnœa, which is on the increase, so that he is unable to perform any but light manual labor. General health very good. Disability three-fourths and permanent."

FIG. 230.—Rifle ball deformed by impact on tenth rib, in its exit from the chest. *Spec.* 4479, Sect. I, A. M. M.

The following abstract illustrates a common variety of gunshot injury of the chest, in which a musket ball, having fractured a rib, perforates a lung, and then, its momentum exhausted, is reflected from the opposite wall of the thorax, and gravitates to the floor of the diaphragm:

CASE.—Private F. H———, Co. B, 14th Connecticut Volunteers, aged 21 years, was wounded in the right chest at Morton's Ford, Virginia, on February 6th, 1864, and death followed in four days. A conoidal musket ball entered the third intercostal space, three inches from the edge of the sternum, fracturing the upper border of the fourth rib badly, and, traversing the middle lobe of the right lung, lodged. The patient was taken to the hospital of the 3d division of the Second Corps, in charge of Surgeon F. A. Dudley, 14th Connecticut Volunteers. There was urgent dyspnœa and prostration, and apparently internal bleeding. After the partial collapse had passed off, these symptoms were mitigated by position, cold drinks, and simple dressings, secured by a bandage about the thorax. Low diet and absolute rest were enjoined. Traumatic pneumonia set in and progressed rapidly to a fatal termination. The autopsy revealed considerable laceration of the right lung; the bullet lay upon the diaphragm. The specimen was contributed, with the history, by Surgeon Justin Dwinelle, 101st Pennsylvania Volunteers. It is shown in the adjoining cut (FIG. 231).

FIG. 231.—Wet preparation of three ribs of the right side, showing the middle one fractured by a conoidal ball. *Spec.* 2117, Sect. I, A, M. M.

The next cases are illustrations of those illusory recoveries, in which the irritation excited by a fractured rib induces pulmonary symptoms closely resembling those caused by tuberculosis, and often described as such:

CASE.—Private Patrick Dolan, Co. F, 69th New York Volunteers, aged 27 years, having been wounded at Antietam, September 17th, 1862, was admitted to hospital at Frederick, Maryland, on the 26th. A conoidal musket ball had entered three inches below the right nipple, fractured the eighth rib, passed through the body, and lodged on the left side of the spine, under the twelfth rib. The right side of the lung was dull in front and behind, and there was a continual discharge of pus through the wound of entry. Good diet and cod-liver oil caused the patient to improve by November 22d, and, on April 20th, 1863, he was discharged cured. He was transferred to West's Building Hospital, Baltimore, on April 21st, and to Fort Wood, New York Harbor, on May 1st, where he was discharged the service on May 30th, 1863. On December 17th, 1863, Pension Examiner Charles Rowland reports that the patient suffers from chronic pain and extreme prostration. He rates his disability three-fourths. On February 8th, 1864, this man is reported to be suffering from cough and symptoms of phthisis. He died on March 4th, 1864, "of phthisis resulting from the wound."

CASE.—Lieutenant Robert Henry, Co. H, 131st New York Volunteers, was wounded at Cedar Creek, October 19th, 1864, by a conoidal ball, which entered the right side of the chest, fractured two ribs and lacerated the right lung. He was discharged from service on February 2d, 1865. Pension Examiner Charles Rowland reports, April 24th, 1865, that pulmonary consumption has resulted, confining the pensioner to his bed. The wound discharges freely. Dr. W. E Mulhallen, of Brooklyn, New York, reports , September 21st, 1866: I attended Lieutenant Henry for some twelve months previous to his death, which occurred at Brooklyn, August 16th, 1866. He was wounded near the sixth rib anteriorly; the wound healed up and inflammation set in, and it again opened in two places about the fourth rib and continued to discharge until his death. The right lung was affected by this wound, and became entirely useless and wasted away. There can be no possible doubt but that his death was caused by the wound.

Opportunities were sometimes, though rarely, afforded of observing the attempts at repair in fractured ribs, when young and robust patients survived their injuries for several weeks. The following is an instance, in which the pathological appearances of the lungs are described, and the collapsed right lung imperfectly figured:

CASE.—Private S. B———, Co. A, 83d New York, having been wounded at Fredericksburg, December 13th, 1862, was admitted into Lincoln Hospital, Washington, on December 23d, 1862. A conoidal musket ball had entered the right chest posteriorly, over the attachment of the eleventh rib, and passed forward. The missile was extracted on the 26th, and simple dressings were applied. Pleuro-pneumonia ensued, and resulted in empyema. On January 3d, 1863, a pint of pus was evacuated from the pleural cavity. The case terminated fatally on January 21st, 1863. Nine hours subsequently a *post-mortem* examination was performed by Assistant Surgeon G. M. McGill, U. S. A. *Rigor mortis* was well marked. The brain weighed forty-five ounces and two drachms. A healthy fluid was found in the lateral ventricles. The bronchial glands were enlarged. The right lung was compressed and crowded into the superior, posterior, and internal part of its chamber. It was adherent to the costal parieties by fibrinous bands. Anteriorly, inferiorly, and externally, occupying the cavity left by the retreating lung, was found a collection of pus, between the two walls of pleura, measuring one pint and a half. This cavity was lined by a thick membrane presenting internally a mucoid appearance. The left lung showed gray hepatization in the upper and posterior portions, the inferior and anterior being congested, and thick, tenacious bronchial secretion exuded from the bronchial tubes. Anteriorly, this lung was firmly adherent to the pericardium. The right lung weighed fourteen, the left twenty-six ounces. The pericardium was filled with two ounces of yellowish fluid. The heart, with the pericardium, weighed ten and a half ounces. Firm fibrinated clots existed in both auricles, continuous within the auriculo-ventricular openings, and a black clot was found in the left ventricle and aorta. The liver, weighing sixty-four ounces, was "nutmegged." Each kidney weighed five and a half ounces. The spleen was firm, and weighed seven and a half ounces. The pancreas weighed four ounces. The greater omentum extended a short distance below the umbilicus; the intestines were much inflated; the lymphatics of the lumbar region and the mesenteric glands were enlarged. The stomach and duodenum were normal; patches of congestion were scattered through the jejunum and ileum; the mucous membrane of the small intestine was softened; the walls of the large intestine were thickened. Portions of the eleventh and twelfth ribs of the right side, completely fractured and surrounded at the points of solution with large irregular formations of callus, were contributed to the Army Medical Museum by Surgeon H. Bryant, U. S. V., and the particulars of the autopsy were furnished by Assistant Surgeon J. Cooper McKee, U. S. A. The specimens are figured in the accompanying wood-cuts (FIGS. 232 and 233), on a much reduced scale, the cut used in *Circular* 6, and in the *Catalogue*, being utilized.

FIG. 232.—Right lung collapsed after gunshot wound. *Spec.* 846, Sect. I, A. M. M.

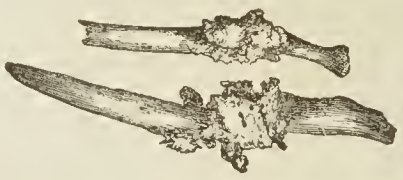

FIG. 233.—Attempted repair after gunshot fracture of floating ribs. *Spec.* 845, Sect. I, A. M. M.

Other illustrations of gunshot fractures of the ribs will appear in the sub-division on *Hæmorrhage*, others again among the *Operations* in the next Section. The Army Medical Museum contains altogether thirty-three specimens belonging to this class. For fracture of the neck of the right first rib by a small round iron ball, see Specimen 1472. For a well-marked *willow* fracture of the left ninth rib, by a conoidal musket ball, striking side-wise, from a youth of twenty, see Specimen 1441. For an example of moderate osseous deposit in thirty-three days, in a fracture of the eighth rib in a boy of nineteen, see Specimen 1901. For examples of necrosis, see Specimens 2809 and 3843. For an instance of consolidated fracture, see Specimen 877. For a curious incomplete fracture, without penetration by the missile, see Specimen 3823,—from a cavalry soldier, aged 28 years, who died from pleuro-pneumonia five days after the reception of the injury.

Complicated Gunshot Wounds of the Lung.—The following abstracts comprise several remarkable instances of recovery after gunshot wounds believed to have involved the pulmonary parenchyma, and also accounts of interesting cases that had a fatal termination:

CASE.—Color Sergeant Samuel McQuaid, Co. I, 124th New York Volunteers, aged 28 years, was wounded at Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal ball, which entered about an inch above the left nipple, passed entirely through the chest, fracturing two ribs in its passage, and lodged in the back near the lower edge of the scapula, from whence it was extracted. He was treated at the field hospital of the 1st division, Third Corps, and, on July 10th, transferred to Satterlee Hospital, Philadelphia. When admitted, the wound was of small dimensions; not painful. The discharge was very profuse and seemed to come from the thoracic cavity, great quantities being discharged when the body was bent forward so as to favor its free expulsion. On the morning of July 24th, symptoms of internal disturbance became manifest; faintness and depression, followed by coldness of the extremities, with dyspnœa, indicated a collection of pus in the pleural cavity. His strength soon began to give away, and he was only kept alive by the free administration of stimulants and such nutritious diet as he could swallow. The first attack lasted during the greater part of the day, growing gradually less severe until evening, when he had almost entirely recovered from its effects. Several slight attacks of the same kind were experienced during the next three days. The wound began to assume an unhealthy appearance and was soon covered with sloughs of a gangrenous character, which continued to extend until it became more than thrice its original size. A wash, composed of equal parts of creasote, alcohol, and water, was applied to the wound, which was afterward dressed with yeast poultice. Under this treatment the sloughs began to separate and come away, leaving a healthy granulating wound. The patient soon began to improve, and, on August 8th, was able to go home on furlough, the wound at that time being almost entirely closed. His respiration was perfect. He was transferred to the Veteran Reserve Corps, January 30th, 1864. He is not a pensioner. Surgeon I. I. Hayes, U. S. V., reports the case.

CASE.—Private *Summerlin Berrien*, Co. G, 47th Georgia Regiment, aged 35 years, was admitted to the Institute Hospital, Atlanta, Georgia, May 18th, 1864, with a gunshot penetrating wound of the chest, received on May 13th, 1864. A conoidal ball entered the back, about two and one-half inches to the left and opposite the sixth dorsal vertebra, passed directly forward, and emerged four inches to the left of the median line and between the floating ribs. When admitted, the wound of entrance was clean and healthy, and suppurating kindly. The wound of exit had closed and had the appearance of a hard tumor; general condition good; free from cough, fever, and pain. The patient continued to improve until June 4th, when he was seized with a troublesome hacking cough, each paroxysm of which caused a jet of dark, sanious, and very offensive fluid to flow from wound of entrance; no pain and but little constitutional disturbance. Expectorants and nutritious diet. June 5th: Dark sanious matter continues to flow from wound of entrance in forcible jets, during each expiratory effort of coughing; during inspiration, air rushes into the wound with a hissing sound; cough continued troublesome, but without expectoration, except white mucus. Auscultation revealed both amphoric respiration and metallic tinkling. Patient had considerable fever. General treatment continued. In this way the patient continued, without much change of interest, until June 13th, when the dark sanious discharge was substituted by healthy pus in moderate quantities. Shortly after this, an abscess formed around the wound of exit and discharged pus freely. June 30th: Patient doing well, with a good prospect of recovery. The case is reported by Surgeon D. C. O'Keefe, P. A. C. S.

CASE.—Private John Collins, Co. G, 26th Iowa Volunteers, was wounded at Arkansas Post, Arkansas, January 11th, 1863, by a musket ball, which entered the left side between the clavicle and first rib, passed downward and backward, perforated the lung, and emerged to the right of the sixth dorsal vertebra. According to the statement of the patient, he expectorated a considerable quantity of blood and experienced a very severe pain in the left side. He was removed to the hospital and adhesive plaster placed over the wounds. The obliquity of the external wounds seemed to prevent the admission of external air. The surgeon evidently seemed to consider it a hopeless case, and paid but little attention to him, so that after a month he had become very much bent over, forward and laterally. Discharged from service on June 1st, 1863. Pension Examiner A. H. Ames reports, July 17th, 1863, that the wound has always been open at exit. "Great pain has existed along the course of the ball, and now a fistula extends from point of exit into the substance of the lung. His lungs are much diseased in consequence. Coughing, together with the pain, and great emaciation consequent upon the suppuration from the wound, will not let him live long." Dr. P. J. Farnsworth, of Lyons, Iowa, states, in a communication to *The Medical and Surgical Reporter*, Vol. XIII, No. 15: "His appearance, when he first came into our hands, was of extreme emaciation. The left shoulder dropped down and the spine bent forward and sidewise. The wound in front was healed, but the one on the back was open, and when he coughed violently, air escaped. The cough was troublesome; the expectoration, bloody pus, in large quantities. The whole aspect was that of the last stages of tubercular disease. He had night sweats and swelling of the lower extremities, and a peculiar clubbing of the fingers. Cod-liver oil and stimulants were administered, with as generous a diet as he could bear. He lingered along for two or three months with slight improvement. There was every indication of tubercular disease and of a large cavity in the lung. A Soldiers' Home having been opened in Chicago, we obtained permission to send him there, he having no friends here. We procured a carriage and carried him carefully to the depot, and saw him aboard a sleeping car, never expecting to see him again. This was in August, and we heard no more from him until December, when he returned in the uniform of an invalid veteran. His appearance was much improved, and he informed us that he did regular guard duty over the rebel prisoners at Camp Douglas. He was not quite well, but much of the cachectic look had passed away. The wound on the back had healed, and he was not much troubled with cough. The clubbed appearance of the fingers had disappeared, and he had become straight. His duties were light, and he was able to perform them. He is now here, having been lately discharged, and is in good health. There is a little dullness over the left lung, but nothing more. He informed us that he was in hospital but once after re-enlisting, about eleven months after he was wounded. The points of interest in the case are the appearance put on from an evidently severe wound through the lungs and the apparent entire recovery therefrom. The entire recovery did not take place in the eleven months, for when re-enlisted he must have been far from well, and only fit for the lightest duty; but before the term of his enlistment expired, he was fit for field duty, and, to all appearance, is now in perfect health."

The six following are abstracts of fatal cases presenting some points of interest:

CASE.—Private G. P. L———, Co. F, 4th New York Artillery, aged 28 years, was admitted into Douglas Hospital, Washington, April 5th, 1865, with a penetrating gunshot wound of the chest, received at South Side Railroad, Virginia, on April 2d. He stated that he spat blood upon the reception of injury. Pleurisy of the right side was well marked, with slight emphysema of the cellular tissue near the posterior wound, from which issued a thin sero-purulent fluid. The pulse and respiration were rapid; air entered and escaped freely from the posterior wound; the patient rapidly grew worse in spite of a generous diet and supporting treatment, and died on April 9th, 1865. Fifteen hours subsequently the entry of the ball was noticed on the back, a little to the right of the spinous process of the ninth dorsal vertebra, whence it had passed inward and upward, fracturing the transverse process, chipping the eighth rib, fracturing the fifth, and escaping from the axilla of the same side. The right pleural cavity contained thirty-four ounces of a dark, offensive, sero-purulent fluid. The parietal and visceral pleuræ were covered with a greenish, soft, cacoplastic lymph, and the right lung, perforated by the bullet through the lower lobe, was compressed and collapsed. There was a slight serous effusion in the left pleural cavity: the remaining thoracic and abdominal viscera appeared healthy. Two specimens accompanying this history were contributed to the Army Medical Museum by Assistant Surgeon W. F. Norris, U. S. A. The first, No. 2411 of the Surgical Section, consists of the seventh, eighth, and ninth dorsal vertebræ, with the fifth, seventh, and eighth ribs of the right side. The right transverse process of the eighth vertebra and the dorsal extremity of the corresponding rib are chipped by a bullet. The fifth rib is obliquely broken, and comminuted on its internal surface, with a transverse fracture externally. The second, a preparation of the lung, is shown in the adjoining cut. (See FIG. 234.)

FIG. 234.—Preparation of the right ung, showing perforation by a bullet. *Spec.* 2707, Sect. I, A. M. M.

CASE.—Corporal Josiah Burton, Co. H, 15th Indiana Volunteers, aged 22 years, received a gunshot penetrating wound of the right chest, at Mission Ridge, Tennessee, November 25th, 1863, the ball entering about four inches below the clavicle and passing directly through. He was taken to the hospital of the 2d division, Fourth Corps, where he remained until December 23d, when he was transferred to Cumberland Hospital, Nashville. When admitted, his health was fair and the wounds had nearly healed. Simple dressings were applied. On December 25th, he had a severe chill, followed by high fever. On the 26th, he complained of a severe pain in the right side, which increased on inspiration. There was dullness on percussion over the right side, and feeble respiratory murmur on auscultation. The pulse was full and somewhat accelerated; tongue coated with a dense white fur; bowels constipated; breathing labored and hurried. Purgatives and diuretics were given, and the patient was cupped to the extent of ten or twelve ounces. 27th: Condition somewhat improved; bowels moved freely. 28th: Bronchial symptoms much worse; pain and tenderness in the hepatic region, less severe; breathing extremely laborious; expectorants, stimulants, and diaphoretics were administered. December 29th: Much worse; countenance anxious; breathing more hurried and labored; great prostration. Death occurred on December 30th, 1863. Necropsy: Right pleural sac contained three quarts of sero-purulent fluid in which flakes of lymph were floating. The pleura-costalis showed marked effects of inflammation. Purulent lymph adhered at every point to the walls of the chest. The lung was completely carnified and attached to the wall at the points of entrance and exit of the missile, and the lower lobe to the diaphragm. The lung, upon section, closely resembled muscle, all vestiges of cellular tissue being entirely obliterated. The bronchus was open to the first ramification, where a mass of crude tubercles, of the size of a sparrow's egg, was found. Miliary tubercles were thickly scattered through the fleshy structure. The mucous membranes of the air-passages were highly inflamed, and the air-tubes filled with muco-purulent matter. The left lung was somewhat congested. The pericardium, thickened to the extent of half an inch, was indurated and contained a pint of sero-purulent fluid. The serous lining was roughened by lymph exudation, which was rapidly assuming a purulent character. The heart presented a singularly roughened, corrugated appearance; the walls being greatly thickened and indurated. The liver was highly congested. The case is reported by Surgeon C. McDermont, U. S. V.

CASE.—Private Morris Ward, Co. H, 63d New York Volunteers, aged 32 years, received two gunshot wounds at Antietam, Maryland, September 17th, 1862. One ball entered the back between the eighth and ninth ribs, left side, half-way between the angle and the junction with the costal cartilage, and lodged; the other entered two inches posterior of anterior superior spinous process of the ilium of left side and lodged in the gluteal muscles. He was at once conveyed to the field hospital of the Second Corps, where water dressings were applied. On September 30th, he was transferred to the hospital at Frederick, Maryland. Previous to admission, the patient did not complain of cough or pain in the chest. On October 5th, a ball could be distinctly felt beneath the nipple, but as the patient was quite weak from profuse suppuration from the wound in the gluteal region, the removal of the ball by excision was deferred. October 8th, burrowing of pus among the gluteal muscles and accumulation of gas. An incision was made an inch above the folds of the nates; but little evacuation of pus. Poultice ordered. On the 12th, another incision was made just below the crest of the ilium and a seton passed through the wound of entrance. The patient seemed much prostrated, but had no cough or expectoration. Tonics and stimulants administered. On the night of the 13th, he expectorated a small quantity of blood, and, on the next day, complained of pain in the chest where the ball had lodged. On examining the chest, a tumor was found to extend from the left nipple downward and inward for two inches, and of the same dimensions in breadth. On applying the ear to the tumor, a sound was heard resembling the passage of air, with a small quantity of liquid, through a slight opening. Tumor tympanitic on percussion; respiration but slightly embarrassed, but patient very restless. The tumor continued to increase, and the patient failed rapidly, notwithstanding the free administration of stimulants; death occurred on the morning of October 17th, 1862. Necropsy: Rigor mortis well marked. Body considerably emaciated. On laying open the wound on the posterior portion of the chest, the ninth rib was found fractured at that point. On

dissecting up the skin over the tumor, some extravasation of blood was found underneath. No opening where the ball could have entered the chest could be found, and it seemed probable that it had passed externally, glancing on the ninth rib, yet no external track was visible. The pericardium over the apex of the heart was adherent to the ribs. Recent pleuritic adhesions on both sides, and left lung adherent to ribs for a large space, where the ball was found underneath. Missile had ulcerated through the intercostal muscle into the lung and was found resting against the diaphragm at the bottom of a large abscess which contained air and pus. Pieces of clothing and bone were also discovered in the diaphragm. The pathological specimen, showing a wet preparation of a portion of the left lung adherent to sections of the third, fourth, fifth, and sixth ribs, is represented in the wood-cut (FIG. 235), and was contributed, with a history of the case, by Acting Assistant Surgeon Alfred North. [It must be understood that the ball entered posteriorly between the eighth and ninth ribs, on a level with the sixth rib anteriorly. The description of its course is not very clear. If it did not fracture the rib, whence came the bits of bone found imbedded in the diaphragm?]

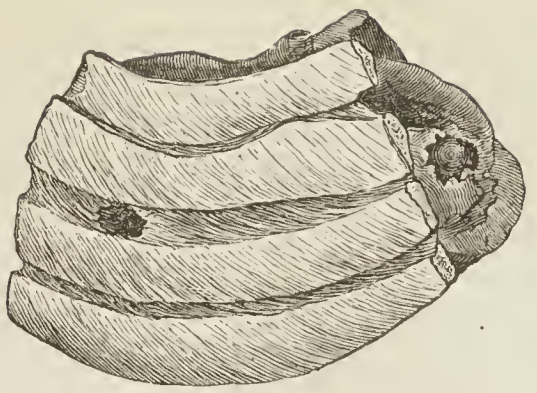

FIG. 235.—Segments of anterior portion of ribs, with condensed portion of upper lobe of left lung, with a round ball, which lay against the diaphragm. *Spec.* 962, Sect. I, A. M. M.

CASE.—Private Carl Behling, Co. E, 26th Wisconsin Volunteers, aged 22 years, received a gunshot wound through the upper lobe of the left lung, at Gettysburg, Pennsylvania, July 1st, 1863. He was at once conveyed to the hospital of the Eleventh Corps, where he remained until July 10th, when he was transferred to Jarvis Hospital, Baltimore. When admitted, he was suffering from a profuse, exhausting hæmorrhage. It ceased, but recurred on the 23d, continuing for two hours. On August 6th, after eating a hearty dinner, he was about to walk from his bed to the door, when a sudden and profuse hæmorrhage occurred. Death resulted in ten minutes. The case is reported by Assistant Surgeon D. C. Peters, U. S. A.

CASE.—Private Medad Beck, Co. G, 11th Vermont Volunteers, aged 46 years, was wounded at Petersburg, Virginia, April 2d, 1865, by a conoidal ball, which entered the left side at fourth rib, about two inches from sternum, perforated the right lung, and emerged below the inferior angle of the scapula. He was treated in the field hospital of the Sixth Corps until April 12th, when he entered Harewood Hospital, Washington. On admission, the injured parts were in tolerably good condition. The patient, however, suffered from dyspnœa, extensive emphysema of surrounding cellular tissues, anxious expression of countenance, and symptoms of pneumo-thorax. Surgeon R. B. Bontecou, U. S. V., freely opened the chest by posterior incision, and removed a large amount of sanious pus. Supporting treatment. Patient died on April 17th, 1865, from exhaustion. Necropsy: Fourth rib fractured anteriorly, and eighth and ninth ribs posteriorly.

CASE.—Private C. Robinson, Co. F, 8th New York Heavy Artillery, aged 39 years, was wounded at Cold Harbor, June 3d, 1864, by a conoidal ball, which entered the left supra-clavicular space, and emerged one inch to the left of the middle dorsal vertebræ. He was treated in the field until June 11th, and was transferred to Lincoln Hospital, Washington. When admitted, his condition was one of very great prostration; suppuration profuse and sanious. Simple dressings were applied to the wound. Death took place on June 21st, 1864, from exhaustion. At the necropsy, the ball was found to have entered the left supra-clavicular space, passed downward through the thoracic cavity, and emerged in the middle of the dorsal region, one inch to the left of the eighth vertebra, having fractured the clavicle one and a half inches from its articulation with the acromion process, also the first, second, third, fourth, fifth, and sixth ribs, close to their attachment to the spine and grooved the posterior surface of the lung, left upper portion. On opening the body the veins were found turgid with exceedingly thin blood, which flowed out in large quantity. The right lung was attached to the wall by recent adhesions, and the left lung by older adhesions. The left cavity contained about two quarts of bloody serous fluid. The upper lobe of the right lung presented two large bullæ, filled with thin blood. There was a wound three and a half inches long in the posterior portion of the upper lobe of the left lung. The base of the lower left lobe was carnified. The fractured clavicle and injured ribs were contributed to the Museum, with the foregoing memoranda, by Acting Assistant Surgeon H. M. Dean. The clavicle is No. 3460 in the Surgical Section. The ribs are represented in the accompanying wood-cut (FIG. 236).

FIG. 236.—Segments of first six ribs of left side, with with pleuritic adhesions to attached portion of lung. *Spec.* 2630, Sect. I, A. M. M.

The next case, of a survival for seven years of an alleged lodgement of a shell fragment in the substance of the left lung, is followed by an abstract of a chest wound believed to have been caused by an explosive musket-ball; which is succeeded by a very remarkable case of recovery after the passage of a large projectile through the cavity of the right chest;

CASE.—Private Patrick F. Bushell, Co. L, 5th United States Artillery, aged 30 years, was wounded at Winchester, Virginia, September 5th, 1864, by a fragment of shell, which entered over the fourth rib, three inches to the left of the median line, wounding the upper lobe of the left lung. He was treated in the field, and on the 29th sent to the hospital at Sandy Hook, Maryland. Simple dressings were applied to the wound. On January 2d, 1865, he was transferred to Fort Hamilton, New York Harbor, and discharged from service May 12th, 1865. Pension Examiner J. H. Oliver reports, December 10th, 1867: statement of pensioner: Shell wound of left breast, throwing him from his horse and rendering him insensible for about four days. Profuse hæmorrhage

occurred from the lung and wound. That from the lung has continued, modified, almost daily, up to present time; also cough expectoration, dull pain, and a sense of stricture through the left thorax. Breathing difficult. Palpitation of the heart, impaired appetite and physical debility. The cough has, in a measure, ceased, and, though feeble, he has partially regained his strength. On examination, an irregular cicatrix and a superficial depression were found near the anterior extremity of the left third rib, looking as if the bone had been driven in. He supposes a fragment of shell penetrated the cavity at that point and lodged within the substance of the lung, where it still remains. Auscultation and percussion indicate lesion in the lower part of the left lung. Tongue furred; skin clammy, with tendency to night sweats. Pension Examiner J. M. Adler reports, June 8th, 1868, the ball entered about two inches above the left nipple, producing compound comminuted fracture of the fourth rib. Portions of bone were probably forced into the substance of the lung; consequent inflammation and abscess of the lung. General debility and great emaciation. Hectic fever, night sweats, and purulent expectoration. Occasional hæmorrhage from lung, sometimes of a very profuse character. The pensioner was last paid on March 4th, 1872.

Case.—Private Philo T. White, Co. I, 7th Michigan Volunteers, aged 19 years, was wounded at Antietam, September 17th, 1862, by an explosive ball, which entered the arm above the elbow, and exploded in the belly of the pectoral muscle, making a cavity large enough to admit the fist. He was treated in the field by simple dressings, with anodynes, until the 27th, when he was transferred to Master Street Hospital, Philadelphia. On the 30th, opisthotonos occurred and was regarded as a symptom of tetanus. Opium was administered internally and externally, and carried to the point of narcotization. The pupil was contracted to the size of a pin-hole during the whole treatment. The patient made a complete recovery, and was discharged from service on December 19th, 1862. Surgeon Paul B. Goddard, U. S. V., reported the case. Examining Surgeon William B. Thomas, of Ionia County, Michigan, gave, May 14th, 1863, a different account: "Ball entered one inch external to the sternal articulation of the fourth rib on right side, fractured the rib, passed into the cavity of the thorax, and emerged one inch below the axilla of right side. The man has frequent hæmoptysis and cough. Disability one-half and temporary."

Case.—Major G. N. Lewis, 12th Connecticut Volunteers, was wounded May 27th, 1863, at Port Hudson, by an iron grape-shot, one and a half inches in diameter and a half pound in weight. This shot, being deflected from a horizontal course to one almost vertical, by the limb of a tree, struck the patient on the upper surface of the right clavicle, and fractured that bone; then taking a course downward, backward, and toward the median line of the body, plunged through the apex of the right lung, emerging from the chest about the third dorsal vertebra, and in contact with the column. Here, meeting the resistance of the skin, and its force nearly spent, it crossed the spine, and lodged under the skin on the left side near the fifth dorsal vertebra, whence it was removed, on the field, by Surgeon M. D. Benedict, 75th New York Volunteers. There was considerable primary hæmorrhage, and, of course, great prostration. When the patient had rallied he was sent on an hospital transport to New Orleans and placed in the St. James's Hospital, in charge of Assistant Surgeon J. Homans, U. S. A., on May 29th. Simple dressings and expectant measures were employed until the inflammatory symptoms had abated, and then tonic medicines and a supporting treatment were substituted. On July 19th, the patient was well enough to take the steamer for New York, and was furloughed. He remained a month in Brooklyn, taking iron, mineral acids, and cod-liver oil, and other restoratives, and morphia continuously, and then went to his mother's house in Middletown, Connecticut, and came under the care of Dr. J. W. Ellis, who has published* an instructive history of the progress and treatment of the case. This narrative is freely quoted in this abstract. In the early part of September, Dr. Ellis found the patient greatly emaciated, with an harassing cough and profuse muco-purulen expectorations, with great pain in the right chest, with diurnal chills, night-sweats, and diarrhœa. There were many of the rational signs of advanced phthisis. It was learned that an exfoliation had been eliminated on the voyage, and an examination of the track of the ball showed that it had become converted into a fistulous canal with indurated walls, communicating directly with some of the larger bronchi, and containing fragments of bone. A forced expiration, with the mouth and nostrils closed, caused air and jets of pus to be expelled from the orifices of entrance and exit; the lung having formed adhesions at both places. Pneumothorax had existed, but the lung early resumed its functions, and was scarcely at all collapsed in the early part of August. Dr. Ellis gave medicines that checked the diarrhœa, and he removed a small fragment of the clavicle from the anterior wound, and laid open the subcutaneous fistula that connected the point at which the shot was cut out between the left fifth and sixth ribs, and that of its emergence from the thorax, near the third dorsal vertebra. Subsequently the posterior opening of the true sinus was enlarged, and fragments of bone were felt, three and a half inches from the surface, imbedded in fine pulmonary

Fig. 237.—Cicatrix of entrance wound of a half-pound grape-shot. (From a photograph.)

Fig. 238.—Cicatrix of exit wound in the same case.

New York Medical Journal, Vol. XIV, p. 511.

tissue. These explorations produced extreme irritation, convulsive cough, and bloody expectoration. Several attempts at extraction were made at intervals of several days. The patient refused to take any anæsthetic, which embarrassed the surgeon's attempt to extract the larger fragment. Finally, seizing the bone with dressing-forceps, dividing the deep tissues with a narrow-bladed knife, and twisting the exfoliation into the axis of the sinus, it was extracted. A profuse discharge of pus poured from the opening, but there was very little hæmorrhage. Some small bits of bone and shreds of foreign material were then removed. There were two subsequent attacks of hæmoptysis, in the next fortnight; afterward the patient convalesced rapidly. "The wound remained open for nearly a year from its reception, and a small stick, three-eighths of an inch in diameter, could be readily thrust through the body without causing him much inconvenience,"—experiments of more than doubtful utility, interrupted by the closure of both orifices in June, 1864. In the middle of October,* promoted to a lieutenant-colonelcy, this brave officer rejoined the Nineteenth Corps, and participated in the campaign in the Shenandoah Valley. The long impacted piece of bone proved to be a fragment of rib. The accompanying wood-cuts (FIGS. 237, 238) are reduced copies of those inserted in Dr. Ellis's paper, which were drawn from photographs. On August 12th, 1865, Lieutenant Colonel Lewis was honorably mustered out of service. Examining Surgeon P. W. Ellsworth, of Hartford, December 26th, 1865, gives the following report of the case: "A grape-shot (presented), weighing one-fourth of an ounce less than half a pound, entered about the right clavicle at the point of ligation of the subclavian artery as it passes the first rib. It fractured the clavicle, and, passing downward and backward, tore up the ribs and was extracted between the scapulæ. The right lung was badly wounded, air passing through the opening for a year. At present the health is better than could be anticipated. Respiration is very faint, all over the back part of right lung, right arm quite weak; cough at times, with a good deal of tenderness on right side of chest. At manual labor he could scarcely be rated as capable of one-third work. Many fragments of bone were removed formerly, leaving a very bad and depressed cicatrice between the scapulæ. Disability two-thirds, and to a great degree permanent." This officer was pensioned, and, in March, 1872, his name was still borne on the rolls, and no change for the worse, in his health, had been reported.

Gunshot Wounds of both Lungs.—Many cases were reported of recovery after penetration of both lungs by gunshot missiles. That life may be prolonged for many days under such circumstances, has been unequivocally demonstrated by dissections; but the probabilities are remote of anything like a permanent restoration to even a partial degree of health after such an accident. The well-known fact that every one of the signs of lung injury that were formerly regarded as pathognomonic may exist singly, and that several of them may even co-exist without there being the slighest lesion of the lung tissue, should admonish the observer to extreme caution in committing himself to a diagnosis of penetration of both lungs by a ball, and lead him to demand the proof of physical as well as rational signs before arriving at an affirmative conclusion. The following cases are cited, but the writer is not satisfied that the evidence in any of them is incontestable. Again and again he has received from professional friends photographs representing cicatrices on the chests of patients in whom, had the missile passed in a direct line from one to the other wound, both lungs would necessarily have been transfixed. But the proof that the projectile had pursued this course was wanting or defective, and the surgeons who reported these cases have, without exception, receded from their earlier convictions, either yielding to the arguments suggested by reading and reflection, or to the more cogent evidence afforded by necropsies in the supposed cases of recovery. That two musket-balls should strike opposite portions of the two sides of the chest, and one or both missiles should inflict only a flesh wound, or that a ball should make the circuit of the thorax beneath the muscular planes, or should run around the costal pleura and emerge opposite its entrance,—these occurrences, though rare, indisputably take place and are not extremely infrequent, and they afford better solutions of the cases recorded in this group than the supposition that the functions of both lungs can be so seriously impaired as gunshot penetration implies, without the supervention of fatal asphyxia at a comparatively early period:

CASE.—Private R. P. Peck, Co. E, 114th New York Volunteers, was wounded at Port Hudson, Louisiana, June 14th, 1863, and was admitted to hospital at Baton Rouge on July 6th. There was a gunshot wound of both lungs; a conoidal musket ball having entered between the third and fourth ribs, two inches to the left of the sternum, and escaped between the seventh

* *Report of the Adjutant General of Connecticut*, for 1863, mentions the case of "Major Lewis, severe shot through body" (p. 142), and the report of the same officer, for 1865, states: "Lieutenant Colonel Lewis reported for duty October 15, 1864."

and eighth ribs, below the posterior border of the right axilla. This man was transferred to the Veteran Reserve Corps, and was subsequently admitted to hospital at Point Lookout, Maryland. On October 8th, 1864, he was examined by a Medical Board, of which Assistant Surgeon W. H. Gardner, U. S. A., was president, and recommended to be returned to duty. His general health and condition were then good; there was no evidence of lung disease, and no inconvenience had been occasioned by the wound, except, according to the patient's statement, some pain in damp weather.

CASE.—Sergeant George E. Grover, Co. C, 3d Maine Volunteers, aged 40 years, having been wounded at Manassas, Virginia, on August 30th, 1862, was sent to Washington, and admitted to Mount Pleasant Hospital on September 1st. A conoidal ball had passed through the right arm, thence into the chest near the right nipple, through both lungs, badly injuring them, and fracturing the sternum, emerged outside of the left nipple. Bleeding from the lungs occurred on September 8th, 9th, and 10th. The wounds were stopped with plugs of lint and dressed simply; brandy, iron, and quinine were administered, and the patient, recovering, was discharged from service on May 20th, 1863, and pensioned. A communication from Pension Examiner J. W. Toward, under date of September 30th, 1867, reports that the patient's sternum is quite tender and sore. He has raised blood from the lungs very often. The lungs are very painful and irritable; there is severe cough, especially on laying down, and the patient is unable to perform any severe manual labor. His disability is rated total and probably permanent.

CASE.—Corporal W. H. Burns, Co. C, 6th United States Cavalry, was wounded at the battle of Beverly Ford, Virginia, June 9th, 1863, by a round ball, which entered immediately in front of the inner third of the left clavicle, passed through the apex of each lung and lodged beneath the right scapula. On the following day he reached the Lincoln Hospital at Washington, D. C., where he remained under treatment until December 25th, 1863, when he was discharged from service. The case is reported by Assistant Surgeon J. C. McKee, U. S. A. On July 15th, 1864, the man was examined by Dr. Cameron, pension examining surgeon, at La Crosse, Wisconsin, who reports his right shoulder and arm atrophied and the use of the right arm considerably impaired; also, that an effort had been made to extract the ball through an incision above the right scapula, and that a number of splinters of bone were removed, but that the missile could not be found.

CASE.—Private Albert Ullman, Co. I, 51st Ohio Volunteers, aged 22 years, was wounded at the battle of Jonesboro', Georgia, August 30th, 1864, by a musket ball, which entered the left shoulder and penetrated the thorax. He was treated at various hospitals and lastly at Camp Dennison, Ohio. On December 20th, 1864, the man was discharged from service, the wound having resulted in partial paralysis of the upper lobe of the left lung. On January 16th, 1865, he was examined by Enoch Sapp, pension examining surgeon, at Spring Mountain, Ohio, who reports him suffering from hæmorrhage of the lungs on much exertion; also, that the missile entered at the angle of the left scapula, passed through the left lung, and is lodged in the right lung.

CASE.—Private George P. Brown, Co. C, 1st United States Sharp-shooters, was wounded by a musket ball through both lungs at the battle of Chancellorsville, Virginia, May 3d, 1863. On the retreat of the Army he was left behind with some other wounded men under charge of Surgeon G. P. Oliver, 111th Pennsylvania Volunteers, at a log-house in the vicinity of the battle-field, where he remained until May 14th, when he was exchanged and removed to the field hospital of the Third Division, Third Army Corps. About two weeks afterward, the patient was allowed to leave for his home on furlough, and on October 3d, 1863, he was discharged from service at Boston, Massachusetts. Dr. Charles L. Fisk, pension examining surgeon, at Greenfield, Massachusetts, reports, under date of April 27th, 1867, as follows: Ball entered right side at eighth rib, posterior to the nipple, passed through the lungs, and escaped on the other side of the chest, exactly opposite the point of entrance. He also states that his right side swells; that he cannot make much exertion, has cough, and can sleep only in a semi-sitting posture; that he also suffers from dyspnœa on exertion, and a great deal of pain in the right side and shoulder. He further reports that ribs were fractured on both sides and are badly united.

CASE.—"The patient was *Harvey McGuire*, at the time a private or non-commissioned officer (sergeant, perhaps) of the 44th Tennessee Regiment, a native Tennesseean, about 40 years of age, and of stout, wiry make, weighing, I suppose, one hundred and sixty pounds. It was in June of 1864, in front of Petersburg, Virginia, he was wounded, the missile being supposed to be from a Whitworth rifle. The bullet passed into one axilla and out at the other, fracturing a rib at the entrance and exit. From the orifice of exit, I removed, when he was brought in, several small fragments and spiculæ of bone. When I first saw him, some two hours after receiving his wound, he was laboring under great dyspnœa, and at every few inspirations coughing and spitting out mouthfuls of frothy blood. Auscultation revealed in the track of the wound, entirely across the chest, loud moist râles. To sum up the case, he recovered, and though for six or eight months was subject to slight hæmoptysis on violent exercise, that I did not believe he would be returned to ranks any more, yet he remained with the command, I think attached to the wagon train, and was with us at the surrender at Appomattox Court-house. The year following the close of the war, he was living somewhere near Fayetteville, Tennessee, from which place he wrote me a letter, in which he said that he had fully recovered his health and was able to undergo active exercise with impunity." Dr. J. D. Jackson, of Danville, Kentucky, communicated the foregoing case in a private letter to the compiler.

CASE.—Sergeant *W. J. Corder*, Co. F, 4th Mississippi Regiment, was wounded at the battle of Kenesaw Mountain, June 27th, 1864, by a conoidal ball, which entered under the pectoral muscle of left side, passed through the breast, and emerged between the second and third ribs, about three inches to the right of the sternum. On June 30th, he was admitted to the Fifteenth Army Corps Field Hospital, at Barton's Iron Works, Georgia. On his admission to hospital, the wound looked well and patient felt comfortable; cold-water dressings were applied, and the patient continued to feel comfortable until July 4th; in the evening, the wound having bled considerably while being dressed, he was attacked with a severe chill. On the morning of the 5th, he was much prostrated, he breathed with difficulty, and perspired profusely; his pulse was slow, but regular; stimulants ordered. In the evening he seemed better, but had another chill during the night. On July 6th, his respiration was very rapid and difficult, and his pulse fast and flickering; he felt but little pain, and that mostly in his bowels. He continued

to sink, and died at 11 A. M. July 6th, 1864. The autopsy showed that the ball had cut the superior lobe of the left lung, divided the sternum through the manubrium, and cut very slightly the superior lobe of the right lung. In the left half of the thoracic cavity the lung was collapsed and the cavity filled with blood, mostly coagulated, while but a small clot was found in the right thoracic cavity. The other organs were normal. Acting Assistant Surgeon R. H. McKay reported the case.

The last case proves unequivocally that a patient may survive a serious gunshot wound of both lungs for nine days at least. Of the many cases returned as gunshot perforations of both lungs, this is the only one in which an autopsy was made at so long an interval from the reception of the injury.*

Hermetically Sealing.—It has been often remarked that the histories of all inventions and innovations have this in common, that it is customary first to deny their utility, and, if this is established, to contest their originality. Its advocates believe that the plan of hermetically closing penetrating gunshot wounds of the chest, proposed by Assistant Surgeon Benjamin Howard, U. S. Army, has shared this fate of successful discovery, and now deserves the merit accorded to useful advances in surgery. The subject has been the occasion of much discussion, and it is proposed, to enable the reader to judge impartially, to place before him all the evidence on the subject that has been obtained by this Office. It will not be a work of supererogation or an unnecessary occupation of space to show conclusively that what has been bruited abroad as the *American Plan* of treating gunshot penetrating wounds of the chest, was fairly tested during the war, and its indiscriminate application found to be pernicious.

On June 25th, 1863, Assistant Surgeon Howard addressed a letter to Surgeon General Hammond, in which he "respectfully submits a new mode of treatment of Gunshot and penetrating wounds of Chest and Abdomen, requesting that necessary arrangements be made to enable him to test its merits at the earliest opportunity." The letter is as follows:

SIR: I have the honor to submit for your consideration the following mode of treatment of gunshot and penetrating wounds of the chest and abdomen in which suppuration has not commenced. All foreign bodies within reach having been removed, and bleeding of the wound having ceased, if it be from gunshot, pare the edges of the wound all round as in the operation for vesico-vaginal fistula; bring the opposite edges together, and retain them in accurate apposition by metallic sutures; carefully dry the wound and parts immediately surrounding; place thereon a few shreds of charpie arranged crosswise after the manner of warp and woof; pour on the charpie

* "If both lungs be wounded at the same time," says Mr. Erichsen (*Science and Art of Surgery*, Vol. I, p. 437), "the result is almost inevitably fatal," but enough cases are on record to prove that the double injury is not necessarily fatal either from hæmorrhage or collapse of lungs and asphyxia. But in a somewhat extensive examination, I find very few allusions to this form of injury. It is true that Sir EVERARD HOME has given (*Trans. of a Society for the Improvement of Med. and Chir. Knowledge*, London, 1800, Vol. II, p. 171) an account of a case in which he traced, thirty-two years after the injury had been received, the course of a ball from where it entered the left lung through the upper lobe of the right lung. But I believe Sir E. Home's *post-mortem* explorations enjoy little credit among his countrymen. DEMME (*Militär-Chirurgische Studien*, Würzburg, 1864, p. 158) records 102 cases of gunshot wounds, with orifices of entry and emergence, of which *eleven* were examples of lesions of both lungs. Of the latter, nine proved fatal. MACLEOD (*op. cit.* p. 246) observes: "Of wounds penetrating both sides of the chest, I met with four examples only. In all these the wound was inflicted by grape, and all died in a short time." GANT, F. J. (*Science and Practice of Surgery*, London, 1871, p. 883), says: "Wound of both lungs simultaneously is proportionately more dangerous; and principally owing to double pneumothorax, with collapse of the lung, inducing more complete asphyxia. Recovery is, however, an occasional termination, even in such cases." But these dicta appear to be suggested by inference rather than observation. Dr. Frazer (*op. cit.*, p. 52) mentions a case of a gunshot wound, opening both cavities of the chest and wounding one lung. The patient lived three days. Surgeon C. S. Woods, 66th New York Volunteers (*Appendix to Part I, Med. and Surg. Hist.*, p. 88), says that after Fair Oaks "a few patients recovered where both lungs were traversed by the same ball. They were doing remarkably well when transferred to general hospital." It is marvellous that several such exceptional recoveries should occur after one action within the personal observation of a single surgeon, and implies a huge number of chest wounds under his charge. Dr. J. Mason Warren records a case (*op. cit.*, p. 564, case 339) of a "*Pistol ball passing through Lungs.*" The missile "passed directly through the right side of the chest, and lodged under the integuments of the back." There was dyspnœa, faintness, hæmoptysis, and extreme mental depression. After reassuring language, and the administration of stimulants, Dr. Warren removed the bullet. The patient "eventually recovered after an attack of pleuritis and pneumonitis." This case should probably be classed with those at the beginning of this subsection, as a perforation through the intercostal spaces. At least there is not the slightest evidence of injury to the left lung, and the author must have used the plural inadvertently.—COMPILER. See also HEMMAN, J. A., *Medicinish chirurgische Aufsätze*, Berlin, 1778; and SCHLICHTING, J. D., *Traumatologia nov. antique*, Amsterdam, 1751.

a few drops of collodion so as to saturate it and form a sort of collodion cloth; let it dry; then apply one or two additional coats of collodion with a camel-hair pencil, and repeat the process until satisfied that the wound is *hermetically sealed*. A dossil of lint may then be applied over it as a compress, secured by adhesive straps and roller bandage. The natural condition of the parts is now approximately restored; the lung is suspended in a closed cavity; the volume of air admitted while the wound was open soon becomes absorbed, and the lung is again at liberty to expand freely. The most distressing symptom, dyspnœa, is relieved immediately. At the hospital of the 2d division, Fifth Corps, I applied this dressing to two cases of gunshot wounds of the chest, several days after they were received at the battle of Chancellorsville, both of them suffering greatly from dyspnœa. In both, the symptoms were alleviated at once, and the next day one said he felt quite well, and the other continued to feel better; the next day they were sent to general hospital and were lost sight of. Suppuration, which is apt to be so excessive and fœtid in consequence of the admission of constantly renewed currents of atmospheric air, promises to be *prevented* or very much modified in extent and character. The coagulated blood in the pleural cavity, which becomes decomposed and fœtid, producing a direct depression of the vital powers, is reduced to a simply mechanical inconvenience, and gradually becomes absorbed. The dressing is economical in point of time as it is quickly applied, and may seldom need renewing. In the case of a private of the 18th United States Infantry, in which I used this dressing, in 1861, for the first time, for bayonet wound of the abdomen, it remained intact until after the wound had entirely healed. It is simple and cleanly, and if successful will prevent the patient becoming obnoxious to himself and to all around him. If this mode of treatment were carried out, I believe the fatality of these wounds would be greatly diminished. I have been unable to demonstrate the value of this treatment, as every case but one (which was remarkably successful) has been sent away to some hospital where the dressing has invariably been removed and replaced by water or other dressing. I therefore respectfully request that, if it meet your approbation, such arrangements be made as will enable me on the first opportunity fairly to test the value of this plan of treatment. The medical director of this corps, and the medical directors of the two divisions, coincide with me as to the probable success of this treatment, and as far as they are able will generously assist me in carrying it out. At the next engagement, my duties will require me to be occasionally at both the division hospitals of the corps, where the medical director of corps kindly proposes that I treat a given number of these cases separately. I would respectfully request that I may be enabled to superintend the subsequent treatment of a certain number of cases and report to you the result." * * *

The permission requested having been accorded * Assistant Surgeon Howard soon had opportunity to practice his method, especially after the great battle of Gettysburg, which was fought shortly afterward. Other surgeons adopted the practice recommended by Dr. Howard, and the treatment, as applied to gunshot penetrating wounds of the chest, was employed in a large number of cases. It has been sought to collect all the cases treated at Gettysburg, and after later engagements, and though this object may not have been fully attained, yet a sufficient number have been collected to afford a fair average of results. Dr. Howard and the other operators necessarily lost sight of many of their patients before the conclusion of the treatment, but in such instances the progress and termination of the cases have been ascertained from hospital records. Dr. Howard had the kindness to furnish the compiler of this work, in 1864, with a list of such patients as he had been unable to trace. The results of all of these have been determined.

The successful cases will be first enumerated, and then those that ended fatally. It has been necessary to abbreviate the abstracts greatly, but when evidence of lesion of the lung tissue was recorded, that fact has never been omitted. Where the abstracts are

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* The endorsement, signed by Surgeon J. R. Smith, U. S. A., by order of the Surgeon General, was as follows: "Respectfully returned thro' Surgeon Letterman. The Surgeon General desires that, at the next battle of the Army of the Potomac, Assistant Surgeon Howard be placed in charge of a field hospital for the treatment of wounds of the chest and abdomen. If necessary to send those cases from the Army he may be sent with them."

accredited to the operater or other reporter, it is not intended to imply that his language is employed, or that the result of the case, or other important facts, may not have been supplied from other sources.

CASE.—Private John Erlee, Co. A, 12th United States Infantry, received a gunshot wound of the right lung at Chancellorsville, Virginia, May 3d, 1863. The wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A, at the hospital of the 2d division, Fifth Corps. Erlee was returned to duty on July 12th, 1863. He is not a pensioner. The case is reported by the operator.

CASE.—Private George Lohr, Co. K, 12th United States Infantry, was wounded at Gettysburg; the ball struck the right chest, below and to the right of the nipple, entered the cavity, and was extracted in the back. He was at once taken to the hospital of the Fifth Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. On July 24th, he was transferred to Mulberry Street Hospital, Harrisburg, and, on September 6th, to the hospital at Fort Columbus, New York Harbor, whence he was returned to duty on November 5th, 1864. The Pension Examining Board at St. Louis, Missouri, reports, March 2d, 1870, that the pensioner suffers from adhesion of the pleura pulmonalis of right side, pain in right lung, dulness on percussion, cough, and general debility, which is greatly aggravated by cold and exposure. The case is reported by the operator.

CASE.—Private Frederick Hoffman, Co. G, 14th United States Infantry, received a gunshot penetrating wound of the right chest at Gettysburg, July 3d, 1863. The ball entered on the left side of the lumbar vertebræ and emerged at the right side of the lower dorsal vertebræ He was taken to the hospital of the Fifth Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. On July 20th, he was transferred to the hospital at York, Pennsylvania, whence he was transferred to Fort Trumbull, Connecticut, December 18th, 1863, for assignment to the Veteran Reserve Corps. He was discharged from service on February 19th, 1865. Pension Examiner R. R. Watson reports, February 6th, 1871, that "Hoffman cannot use much exertion; draws his legs after him rather than lift them up; suffers a good deal of pain in the back, and is not able to carry anything heavy." The case is reported by the operator.

CASE.—Private Monroe P. Sanders, Co. F, 93d Pennsylvania Volunteers, aged 17 years, was wounded at the Wilderness, Virginia, May 5th, 1864, by a conoidal ball, which fractured the clavicle of the right side, passed through the right lung, and emerged immediately under the right scapula. He was taken to the hospital of the 2d division, Sixth Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. On May 25th, he was transferred to Lincoln Hospital, Washington, and, on July 19th, to Mower Hospital, Philadelphia. When admitted, both wounds had healed; fracture united. Patient stooped a little, and could not take a full inspiration on the right side. He was transferred to the 118th company, 2d battalion, Veteran Reserve Corps, January 27th, 1865, and discharged from service on May 29th, 1865. Pension Examiner George P. Lineweaver reports, June 10th, 1869, that "the posterior wound is unhealed and constantly discharging. He has cough, with expectoration of mucus, and complains of difficulty of respiration. Disability total and permanent."

CASE.—Private William R. Stouffer, Co. E, 184th Pennsylvania Volunteers, aged 17 years, was wounded at Petersburg, Virginia, June 22d, 1864, by a conoidal ball, which entered the right pectoralis major muscle, and emerged at the lower angle of the scapula, perforating the cavity and lung. He was taken to the hospital of the 2d division, Second Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. On July 16th, he was sent to Sixteenth and Filbert Streets Hospital, Philadelphia, whence he was transferred to the Veteran Reserve Corps on January 25th, 1865, and assigned to duty at Satterlee Hospital. Surgeon Charles Page, U. S. A., reports, December 22d, 1868: "Stouffer has now enlisted for special service at the artillery school of Fort Monroe. His present condition is one of robust health, cheeks ruddy, and muscles firm and well developed. The respiratory murmur is perfect in the vicinity of the wound, at least I can detect no abnormal sounds, and there is perfect resonance on percussion. His chest measures 29½ inches, and expands to 32⅝ inches." A communication from Surgeon John E. Summers, U. S. A., dated Fort Monroe, Virginia, April 20th, 1872, states that no trace of this man can be found on the records of that post.

CASE.—Private Thomas Larkin, Co. F, 70th New York Volunteers, was wounded at Manassas Gap, July 23d, 1863, by a musket ball, which entered between the fourth and fifth ribs of the right side, passed upward and obliquely backward through the left lung, and emerged near the left shoulder. The wounds were closed by silver sutures, and hermetically sealed on the field by Assistant Surgeon B. Howard, U. S. A. The anterior wound, however, opened during the patient's conveyance to Washington. He was admitted into Mount Pleasant Hospital on July 30th, 1863, at which time there was pain in the left side; some cough, with expectoration of bloody sputa; a tolerably full pulse at 90 per minute; and a free and healthy discharge from the wound. The pain and cough yielded readily to the treatment adopted; the wound healed rapidly, and, at the end of three weeks, the patient was dismissed from further medical attention, and returned to duty on August 21st, 1863. The case is reported by Assistant Surgeon C. A. McCall, U. S. A. This soldier has not applied for a pension.

CASE.—Sergeant Frank C. Jones, Co. B, 64th New York Volunteers, aged 22 years, was wounded at Spottsylvania, Virginia, May 12th, 1864, by a conoidal ball, which entered the left axilla, passed down the back part of the chest, and emerged to the right of the spine, near the eleventh dorsal vertebra, striking its spinous process and injuring the posterior portion of the left lung. He was at once taken to the field hospital of the 1st division, Second Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. On May 25th, he was sent to Emory Hospital, Washington. Water dressings were applied. He was furloughed on June 1st, and remained at home for six months, during which time he was commissioned as lieutenant. He returned to duty, was commissioned as captain, and remained with his regiment until final muster-out, May 8th, 1865. Pension Examiner William Loughridge reports, December 9th, 1868, that "the injury was followed by hæmorrhage and inflammation of the lungs. He still suffers from frequent attacks of inflammation of the left lung and from the injury to the spine, and is incapacitated from performing any kind of manual labor." The case is reported by the operator.

CASE.—Private Francis McCabe, Co. A, 17th United States Infantry, aged 23 years, was wounded at Spottsylvania, Virginia, by a conoidal ball, which entered about three inches below the middle of the left clavicle, passed through the chest, and emerged about the centre of the scapula. He was at once taken to the hospital of the 1st division, Fifth Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. On May 14th, he was transferred to Columbian Hospital, Washington. Simple dressings were applied. He was sent to New York on August 3d, and discharged from service on August 25th, 1864. Pension Examiner Theodore H. Jewett reports that "the left arm is helpless and the left lung damaged. He will probably recover in time." The case is reported by the operator.

CASE.—Corporal Michael Cunningham, Co. F, 1st United States Sharp-shooters, aged 21 years, received a gunshot penetrating wound of the left side of the thorax at the Wilderness, Virginia, May 5th, 1864. He was conveyed to the hospital of the 3d division, Second Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. He was transferred, on May 25th, to the 1st division hospital, Alexandria; on June 5th, to Lovell Hospital, Portsmouth Grove, Rhode Island, and, on September 25th, to Baxter Hospital, Burlington, Vermont, whence he was returned to duty on October 26th, 1864. He is not a pensioner. The case is reported by the operator.

CASE.—Corporal Joseph Loll, Co. K, 63d Pennsylvania Volunteers, was wounded at Chancellorsville, Virginia, May 3d, 1863, by a musket ball, which perforated or penetrated the left lung. The wound was hermetically sealed on the field by Assistant Surgeon B. Howard, U. S. A., after which he was conveyed to the field hospital of the 1st division, Third Corps. On May 7th, he was transferred to St. Aloysius Hospital, Washington, and returned to duty on September 16th, 1863. He is not a pensioner. The case is reported by the operator.

CASE.—Corporal Peter Welker, Co. A., 1st United States Sharp-shooters, was wounded at Manassas Gap, July 23d, 1863, by a conoidal musket ball, which entered above the right nipple, between the fourth and fifth ribs; passed through the lung and emerged at the inferior border of the scapula, fracturing at the same time the sixth rib. The wounds were hermetically sealed on the field by Assistant Surgeon B. Howard, U. S. A. The patient was sent to Washington, and admitted into Mount Pleasant Hospital, July 30th, suffering from pain in the right lung and some dyspnœa, otherwise doing well. The dyspnœa, attended with pain, increased almost to suffocation; pulse becoming greatly accelerated until the night of July 31st, when the posterior dressing burst open, and a profuse discharge of clotted blood and purulent matter took place; a similar collection, amounting to nearly a pint, gushed from the anterior wound, upon the removal of its dressings, the following morning. Immediate relief was obtained and general improvement commenced; the respiratory murmur, which had been absent in the lower portion of the lung, returned and was perceptible everywhere, except in the immediate vicinity of the wound. The purulent discharge continued profuse, until about the first of October, but, by the 13th of this month, it had, in a great measure, ceased, and the patient was allowed a furlough. He returned on December 13th, 1863, greatly improved. The anterior opening had closed and the posterior nearly; from the latter, necrosed bone was subsequently removed. Opiates and stimulants were administered throughout the treatment, according to the requirements of the case. On February 29th, 1864, crepitant râles were heard only in the region of the wound, and some pain felt about the shoulders. This man was discharged from service on March 29th, 1864, and was subsequently pensioned. Pension Examiner S. A. Fisk reports, July 20th, 1867, "the pensioner suffers from an inward soreness and spitting of blood; can only do light work, and has pains in the head." The case is reported by Assistant Surgeon C. A. McCall, U. S. A.*

CASE.—Private *J. W. Jones*, Co. E, 48th Georgia Regiment, was wounded at Manassas Gap, July 23d, 1863, by a conoidal musket ball, which entered half an inch above the left nipple, traversed the lung, and emerged near the spine of the left scapula. The wounds were closed on the field by Assistant Surgeon B. Howard, U. S. A., with silver sutures, and hermetically sealed. The patient was conveyed to Washington, and admitted, on July 30th, into Mount Pleasant Hospital, complaining of severe pain in the left side and shoulder; his breathing was short and painful; crepitant râles were distinguished over the left mammary region, and at the apex of the lung; pulse 100 per minute, and hard; countenance flushed; skin hot and dry; tongue white. On removing the dressings, there was a moderate discharge of tolerably healthy pus, attended by an almost instantaneous relief from dyspnœa and pain. The pneumonia yielded to treatment in a few days; and in about three weeks the wounds had healed, and the patient was dismissed from further treatment. On September 23d, he was transferred to Lincoln Hospital, Washington, whence he was transferred to the Old Capitol Prison on October 14th, 1863. The case is reported by Assistant Surgeon C. A. McCall, U. S. A.

CASE.—Corporal Henry G. Powles, Co. K, 2d Wisconsin Volunteers, was wounded at the Wilderness, Virginia, May 10th, 1864, by a musket ball, which entered between the second and third ribs, passed through the right lung, and emerged below the right scapula. The wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. On May 14th, he was sent to Campbell Hospital, Washington, whence he was transferred to the Veteran Reserve Corps, April 18th, 1865. He was discharged from service on June 19th, 1865. Pension Examiner P. R. Hoy reports, February 10th, 1866, "the pensioner suffers from adhesions and spitting of blood." He re-examined him on September 11th, 1867, and stated that the consolidation of the lung and spitting of blood had steadily increased. The case is reported by the operator.

In ten of the thirteen preceding abstracts, it is specified that an injury of the *lung* existed. In seven of the thirteen, recovery was partial, the patients being pensioned, with various degrees of disability.

* The history of this case, up to the date of that publication, was inserted in the surgical report in *Circular No.* 6, S. G. O., 1865, and introduced with the observation that: The histories of the cases, in which this plan (of hermetically sealing) was adopted, have been traced, in most instances, to their rapidly fatal conclusion. The following case is the only recorded exception." This statement was exact at that date; but, as is seen, many other instances of favorable terminations have since been traced. I believe the evidence still fully sustains the "unqualified condemnation of the practice," then expressed.—COMPILER.

The plan succeeded, or patients treated by it survived, in the hands of many other surgeons, as the following abstracts show:

CASE.—Captain W. R. Peddle, Co. A, 157th Pennsylvania Volunteers, received a gunshot penetrating wound of the thorax and a flesh wound of the arm at Petersburg, Virginia, July 7th, 1864. The wound was hermetically sealed at the hospital of the Fifth Corps, where he remained until July 13th, when he was sent to DeCamp Hospital, New York Harbor. On September 15th, he was admitted to Officers' Hospital, Annapolis, Maryland, and discharged from service on September 27th, 1864. Not a pensioner. The case is reported by C. N. Chamberlain, U. S. V.

CASE.—Corporal Lucius G. Bradley, Co. B, 136th New York Volunteers, aged 29 years, was wounded at Gettysburg, July 2d, 1863; the missile entered the right chest beneath the clavicle at its articulation with the sternum, and lodged between the spine and scapula. The patient stated that the wound bled very freely at first, and, in a few minutes, he discovered that he could not breathe without, in the first place, closing the wound with his hand. The hæmorrhage ceased when he lay upon his back. The surgeon of his regiment and the brigade surgeon pronounced his case hopeless. The wound was closed with metallic sutures and hermetically sealed with collodion, by Surgeon John J. Milhau, U. S. A., medical director of the Fifth Corps. Nourishing diet was administered and quiet enjoined. On July 24th, he was transferred to Chestnut Street Hospital, Harrisburg, Pennsylvania. When admitted, he was very weak, and had entirely lost his voice. The wound had never been interfered with after the first dressing was applied on the battle-field. On August 15th, the dressings became loose, and were removed, with the sutures; the wound was found to be quite healed. He was discharged from service on August 18th, 1863. On one occasion during his stay at the Harrisburg Hospital, he expectorated a little bloody pus. Pension Examiner W. M. Herron reports, on February 16th, 1866, that the pensioner suffers from pain at the point where the ball lodged. The case is reported by Acting Assistant Surgeon W. S. Woods. Bradley was in tolerably good health on March 4th, 1872, when he drew his half pension.*

CASE.—Private John P. Frink, Co. F, 17th Maine Volunteers, aged 19 years, was wounded at Deep Bottom, Virginia, August 18th, 1864, by a conoidal ball, which penetrated the left chest in the seventh intercostal space, one inch outside of a vertical line through the nipple, and emerged near the angle of the same rib. The wound was hermetically sealed at the hospital of the 3d division, Second Corps. On August 27th, he was transferred to Finley Hospital, Washington, and discharged from service on June 8th, 1865. Pension Examiner Eugene F. Sanger reports, October 27th, 1868: "Necrosis followed, and spitting of blood. Dulness in region of wound and adhesion of lung to pleura. Pain, soreness, and dyspnœa upon exposure and hard work." The case is reported by Surgeon O. Everts, 20th Indiana Volunteers.

CASE.—Lieutenant Adolphus F. Vogelbach, Co. B, 27th Pennsylvania Volunteers, received a gunshot penetrating wound of the chest at Mission Ridge, Tennessee, November 25th, 1863; the ball entered between the seventh and eighth ribs, and passed through the middle lobe of the right lung. He was taken to the hospital of the 2d division, Eleventh Corps, and the wound was hermetically sealed with sutures and collodion. On December 22d, he was convalescent, and was transferred to Officers' Hospital, Lookout Mountain, Tennessee, whence he was furloughed on February 3d, 1864. Having returned to duty, he was promoted to the rank of Captain, April 27th, and mustered out with his company on June 10th, 1864. Pension Examiner James Cummisky reports, June 17th, 1864, that Vogelbach is much weakened and unable to do the lightest kind of work. Pension Examiner Wm. M. Cornell reports, October 26th, 1865: Wound more painful; raises more blood, and has greater difficulty of respiration. The case is reported by Surgeon D. G. Brinton, U. S. V.

CASE.—Private Henry Herrick, Co. H, 5th Michigan Volunteers, aged 20 years, was wounded at Petersburg, Virginia, June 16th, 1864, by a conoidal ball, which entered anteriorly between the second and third ribs, injured the apex of the right lung, and passed out behind the scapula. He was taken to the hospital of the Second Corps, where the wound was hermetically sealed. On the 24th, he was transferred to Mount Pleasant Hospital, Washington. On January 4th, 1865, he was sent to Harper Hospital, Detroit, Michigan, whence he was discharged from service on February 5th, 1865. A communication from the Commissioner of Pensions, dated April 8th, 1868, states that Herrick is a pensioner, his disability being rated one-half and permanent. The case is reported by Surgeon O. Everts, 20th Indiana Volunteers.

CASE.—Private Horace B. Walters, Co. D, 84th Indiana Volunteers, aged 21 years, was wounded at Kenesaw, Georgia, June 27th, 1864, by a conoidal ball, which penetrated the left side of the thorax. He was taken to the hospital of the 1st division, Fourth Corps, where the wound was hermetically sealed by Assistant Surgeon William H. Matchett, 40th Ohio Volunteers. On July 3d, he was transferred to Hospital No. 2, Chattanooga; on July 23d, to Hospital No. 8, Nashville; on September 9th, to Jefferson Hospital, Indiana, and, on December 12th, to Cumberland Hospital, Nashville, whence he was returned to duty on December 20th, 1864. He is not a pensioner. The case is reported by Surgeon J. D. Brumley, U. S. V.

CASE.—Lieutenant Percival Knowles, Co. K, 6th Maine Volunteers, aged 23 years, was wounded at Rappahannock Station, Virginia, November 7th, 1863, by a conoidal ball, which entered three inches above the right nipple, passed backward and downward through the right lung, and lodged in the muscles of the back, at the lower border of the scapula. On the 9th, he was admitted to Stanton Hospital, Washington. There was slight dyspnœa, with a full and irregular pulse; an absence of

* In a letter from Ann Arbor, of July 20th, 1867, to Surgeon General Barnes, Dr. Wm. F. Breakey, late Assistant Surgeon 16th Michigan Volunteers, transmits what purports to be "a tabular statement of eighteen cases of penetrating wounds of chest, operated on by B. Howard, Assistant Surgeon U. S. A., at Gettysburg, by hermetically closing them," and further remarks, alluding to the case of Bradley, that "it would be interesting to know whether the *one* case, shown by these tables to have recovered, united with first intention or became an open wound." Dr. Breakey subsequently published (*Mich. University Med. Jour. Oct.*, 1871) a repetition of his statement, which is a curious example of the abuse of statistical enquiry. It is interesting to know that Dr. Howard was *not* the operator in the case of Bradley,—that the wound did *not* reopen,—that the case was *not* a solitary success among those enumerated in his tabular statement,—both LOHR and HOFFMAN having recovered,—and then to consider what weight should be accorded to Dr. Breakey's argument.—COMPILER.

the respiratory murmur below the lower end of the scapula, and complete dulness on percussion; he suffered no pain, and but slight constitutional disturbance. The track of the wound was excised down to the ribs; the edges united by sutures deeply inserted, and the whole covered by isinglass plaster and collodion. On the 12th, there was some pain. The dyspnœa and effusion had increased, and a slight friction sound was heard at the upper and lateral part of the chest. The dressings were removed on the 14th; there was no evidence of union by first intention; the wound was suppurating. The bowels being confined, a light cathartic was given. On December 4th, the ball was extracted, and water dressings were applied. By December 22d, both wounds had healed, and effusion in the chest was nearly all absorbed. The patient was discharged from service on August 15th, 1864. Pension Examiner W. L. Nicholson reports, April 20th, 1870, that "solidification of the lung has taken place. Hæmorrhage, which was not present at the date of his discharge to any marked extent, now occurs on an average every two or three weeks, and, in my opinion, tubercles have formed. His strength has so diminished as to render labor impossible. Habits regular and moral." The case is reported by Assistant Surgeon G. A. Mursick, U. S. V.

Case.—Sergeant Jonathan McAllister, Co. I, 126th Ohio Volunteers, aged 31 years, was wounded at the Wilderness, Virginia, May 12th, 1864, by a conoidal ball, which penetrated the left lung. He was taken to the hospital of the 3d division, Sixth Corps, where the wound was stitched and collodion applied. On May 24th, he was transferred to the 1st division hospital, Alexandria, whence he was discharged from service on February 20th, 1865. The use of the left arm was impaired. He is not a pensioner. Surgeon Robert Barr, 67th Pennsylvania Volunteers, reports the case.

Case.—Captain George W. Tomlinson, Co. I, 99th Pennsylvania Volunteers, aged 40 years, was wounded at Deep Bottom, Virginia, August 15th, 1864, by a conoidal ball, which entered about the fourth rib near the nipple, passed downward through the lung, and lodged in the back near the seventh or eighth ribs. He was taken to the hospital of the 3d division, Second Corps, where the wound was hermetically sealed and the ball extracted. On August 23d, he was transferred to Seminary Hospital, Georgetown, D. C.; simple dressings were applied. He was furloughed on October 20th, and admitted to Officers' Hospital, Philadelphia, December 12th. On February 13th, 1865, his debility was on the increase, owing to a profuse discharge from the wound. There were no symptoms, except a diminished vesicular murmur along the course of the wound. Tonics, stimulants, and expectorants were administered. The discharge gradually diminished, and the patient improved. On March 1st, after some exposure, he had a severe attack of coughing, attended with copious muco-purulent expectoration. He was returned to duty on May 15th, 1865, at which time his general health was fair; but the wound was still discharging, and he suffered occasionally with violent attacks of coughing, from ulceration of the fauces and elongation of uvula. The upper portion of the lung was healthy; but there were indications of consolidation of the lower portion. Pension Examiner Wilson Jewell reports, November 28th, 1865; "wound not healed; suppuration from diseased bone going on. Some cough and slight expectoration. Disability total and temporary." The case is reported by Surgeon O. Everts, 20th Indiana Volunteers.

Case.—Private Thomas Conauton, Co. F, 56th New York State Militia, aged 19 years, while on duty at "Rebel Camp," Elmira, New York, August 13th, 1864, was wounded by the accidental discharge of an Enfield rifle. A conoidal ball entered half an inch to the right of and below the right nipple, passed through the lung, and emerged at the margin of the posterior border of the inferior angle of the right scapula. The same ball mortally wounded a second man, and passed through the knapsack of a third. Conauton felt faint from the loss of blood which followed, but did not fall immediately. Cold-water dressings and bandage were applied. Half an hour later, whiskey was administered, upon swallowing which, he raised blood, and, at each effort to cough, the blood ran freely from his mouth until he was nearly exhausted. Three hours after the reception of the injury, he was admitted to the hospital at Elmira. There was considerable hæmorrhage from both wounds and great dyspnœa. On the removal of the dressings, the dyspnœa increased to almost immediate suffocation; but could readily be relieved by drawing the integument so as to close the external wounds. The anterior and posterior wounds were at once converted into incised wounds by Assistant Surgeon Charles A. Leale, U. S. V., and the edges brought together and retained in position by silk sutures and adhesive straps, and hermetically sealed with collodion. A bandage was then applied, producing moderate pressure over both wounds. An opiate having been administered, the patient was laid on his back. He passed a very comfortable night; on the next morning there was considerable febrile movement, increased bronchial respiration, and a slight cough. Pulse 120. For four or five days, blood, of a bright arterial color, mingled with sputa, came away in mouthfuls, amounting to at least eight ounces a day. The dressings came off in three days; the wounds had both closed by adhesion; not the slightest suppuration took place from the anterior wound, and only a few drops from the integumentary surface of the posterior wound. Acute pneumonia supervened in the right side, which lasted between two and three weeks. The patient convalesced without an unfavorable symptom, and was returned to duty in less than five weeks from the reception of the wound. On March 19th, 1866, he was carefully examined. Externally, nothing could be seen except the cicatrices and marks of the sutures, while on auscultation and percussion, a dulness was found at the middle lobe of the right lung, confined to a space of about four inches in circumference, where pleuritic adhesion had taken place. Otherwise that lobe was perfectly healthy, as were the remaining lobes of both right and left lungs. He was in perfect health. The case is reported by the operator.

Case.—Private *Joseph Douricott*, Co. C, 26th Georgia Regiment, aged 17 years, was wounded at Winchester, Virginia, September 19th, 1864, by a conoidal ball, which penetrated the left lung. He was at once conveyed to the depot field hospital, where the wound was hermetically sealed. On January 4th, 1865, he was transferred to West's Buildings Hospital, Baltimore, whence he was sent to Fort McHenry, Maryland, May 9th, 1865, for parole.

Case.—Private Patrick Dorning, Co. F, 15th United States Infantry, aged 28 years, was wounded in a street brawl at Mobile, November 1st, 1865, by a buckshot, which penetrated the left lung. He was admitted, on the next day, to the post hospital at Mobile. The wound was sealed at first, after which simple dressings were applied. The patient was doing well on December 31st, 1865. He deserted on February 20th, 1866. There is no later account of him on the rolls of the Adjutant General's Office. Surgeon Samuel Kneeland, U. S. V., reports the case.

Two cases, in which this plan of treatment was successfully employed, are found in the Confederate records. At least we may infer that the case referred to in the first abstract was successful as the patient was strong enough to escape from hospital after six weeks of treatment:

CASE.—Private *W. D. Wheeler,* Co. K, 2d Virginia Cavalry, received a penetrating gunshot wound of the chest at Winchester, Virginia, September 19th, 1864, a conoidal ball passing through the apex of the right lung. He was conveyed to the field hospital, where the wound was hermetically sealed. He escaped on October 25th, 1864. Operator unknown.

CASE.—Private *J. W. Branson,* Co. C, 9th Virginia Cavalry, aged 27 years, of robust constitution, was wounded on July 29th, 1864, by a conoidal ball, which entered the right chest three inches below the axilla, traversed the right lung, and lodged near the spinal column on a level with the wound of entrance. Hæmorrhage from the lung followed the reception of the injury. The ball was removed by counter incision. He was admitted, on the next day, to Chimborazo Hospital, Richmond. It was decided, as the wound had been so recently received, and his condition every way favorable, to treat the case by hermetically sealing the wound. The orifice of entrance was carefully closed by means of thin layers of cotton, saturated with collodion. These were renewed as often as found necessary to prevent the introduction of air into the chest. The case progressed favorably, attended by only slight circumscribed inflammation of the lung, some effusion in the pleural cavity, and a little fever, so slight, however, as to require but little treatment. The patient, at the time of his admission, and for several weeks afterward, complained of great soreness of both sides of the chest—more of the left than of the right. This soreness was attributed to a severe fall from his horse at the time he was wounded. Under appropriate treatment and rest, the soreness gradually subsided, and the patient, when fairly convalescent and walking about the ward, was furloughed, and left in a carriage for his home in Westmoreland County, Virginia, with every reason to expect a speedy and perfect recovery. The case is reported by the operator, Surgeon P. F. Browne, P. A. C. S., in the Confederate States Medical and Surgical Journal for October, 1864.

In this group of partial or entire recovery in fourteen cases, treated on the plan under consideration by other operators than Dr. Howard, it is stated in ten instances that the substance of the lung was wounded. Six of the fourteen patients are now (1872) pensioners, with serious disabilities,—two deserted and two were paroled or furloughed, and their ultimate histories are unknown. Uniting this with the preceding group, a total is presented of twenty-seven cases of gunshot penetrating wounds of the chest, including twenty instances attended by wound of the lung, in which, it is claimed, recovery took place under the method of treatment by hermetically sealing. The validity of these claims will be discussed at the close of this subsection.

In contrast to the foregoing cases of more or less complete success of the treatment of gunshot wounds of the chest by "hermetically sealing," we have now to examine a series in which this method was unsuccessfully employed:

CASE.—Private Joseph Mallenbry, Co. B, 16th Michigan Volunteers, aged 30 years, received a gunshot penetrating wound of the chest and left arm at Gettysburg, July 2d, 1863. He was taken to the hospital of the Fifth Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. Pyæmia set in on July 20th; stimulants, tonics, and nourishment were administered. Death resulted on July 24th, 1863. The autopsy showed infiltration of the right lung, and a conoidal ball was lodged in its middle lobe. There was no accumulation in the pleura. The case is reported by Surgeon A. M. Clark, U. S. V.

CASE.—Corporal Martin Noonan, Co. H, 64th New York Volunteers, received a gunshot wound of the lung at Spottsylvania, Virginia, May 12th, 1864. He was taken to the hospital of the 1st division, Second Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. Death resulted on May 18th, 1864. This case is reported by the operator.

CASE.—Lieutenant Edward S. Abbott, 17th United States Infantry, received a gunshot wound of the lung at Gettysburg, July 3d, 1863. Assistant Surgeon B. Howard, U. S. A., hermetically sealed the wound at the hospital of the Fifth Corps. Death occurred on the same day. The case is reported by the operator.

CASE.—Sergeant Aaron E. Banker, Co. E, 140th New York Volunteers, received a gunshot wound of the lung at Gettysburg, July 3d, 1863. He was taken to the hospital of the Fifth Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. Death on July 12th, 1863. The case is reported by the operator.

CASE.—Corporal Daniel Norcross, 3d Massachusetts Battery, received a gunshot wound of the lung at the Wilderness, Virginia, May 8th, 1864. The wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. Death resulted on May 11th, 1864. The case is reported by the operator.

CASE.—Private Henry A. Amidon, Co. K, 4th Vermont Volunteers, received a gunshot wound of the lung at the Wilderness, Virginia, May 5th, 1864. The wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. Death at the field hospital. The case is reported by the operator.

CASE.—Private Charles McGordas, Co. I, 1st Massachusetts Artillery, received a gunshot wound of the lung at Petersburg, Virginia, June 18th, 1864. The wound was hermetically sealed at the hospital of the 3d division, Second Corps, by Assistant Surgeon B. Howard, U. S. A. The patient died on June 24th, 1864. The case is reported by the operator.

CASE.—Private William S. Jordan, Co. G, 20th Maine Volunteers, aged 18 years, received a gunshot wound of the left lung at Gettysburg, July 2d, 1863. He was taken to the hospital of the Fifth Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. Pyæmia developed on July 20th; stimulants and tonics were administered. Death resulted on July 24th, 1863. At the necropsy, the left side of the chest was found filled with pus, displacing the heart. The case is reported by Surgeon A. M. Clark, U. S. V.

CASE.—Private Edward McGoldrig, Co. G, 69th New York Volunteers, received a gunshot wound of the right lung at Ny River, Virginia, May 12th, 1864. The wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A., at the hospital of the 1st division of the Second Corps. Death on the same day. The case is reported by the operator.

CASE.—Sergeant Alexander G. Ross, Co. E, 140th New York, was wounded on July 2d, 1863, at Gettysburg, by a musket ball, which penetrated the lung. The wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A., after which he was sent to Seminary Hospital, Gettysburg. Death resulted on July 9th, 1863. The case is reported by the operator.

CASE.—Private John Mellott, Co. D, 7th West Virginia Volunteers, aged 24 years, received a gunshot wound of the right lung at the Wilderness, Virginia, May 5th, 1864. He was taken to the hospital of the 2d division, Second Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. The patient died on May 8th, 1864. The case is reported by the operator.

CASE.—Private Michael H. Moffatt, Co. F, 10th Massachusetts Volunteers, aged 22 years, received a gunshot wound of the lung at the Wilderness, Virginia, May 5th, 1864. He was taken to the hospital of the 2d division, Sixth Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. Death on May 8th, 1864. The case is reported by the operator.

CASE.—Private Jeremiah Dorgan, Co. D, 7th Massachusetts Volunteers, received a gunshot wound of the lung at the Wilderness, Virginia, May 5th, 1864. He was taken to the hospital of the 2d division, Sixth Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. Death resulted on May 8th, 1864. The case is reported by the operator.

CASE.—Private Charles H. Wilson, Co. H, 4th Michigan Volunteers, received a gunshot wound of the left lung at Gettysburg, Pennsylvania, July 3d, 1863. The wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. Death on July 5th, 1863. The case is reported by the operator.

CASE.—Sergeant Alva C. Wilcox, Co. D, 17th Connecticut Volunteers, received a gunshot wound of the lung at Gettysburg, Pennsylvania, July 3d, 1863. The wound was hermetically sealed on the field by Assistant Surgeon B. Howard, U. S. A. Death resulted on July 7th, 1863. The case is reported by the operator.

CASE.—Private John Contoil, Co. G, 6th United States Infantry, aged 22 years, was wounded at Gettysburg, Pennsylvania, July 3d, 1863, by a musket ball, which penetrated the lung. The wound was hermetically sealed on the field by Assistant Surgeon B. Howard, U. S. A., after which the patient was conveyed to the Seminary Hospital, Gettysburg, where he died on July 5th, 1863, from secondary hæmorrhage. The case is reported by the operator.

CASE.—Private Henry Williams, Co. D, 1st Connecticut Heavy Artillery, was admitted to the base hospital of the Eighteenth Corps, July 1st, 1864, with a gunshot penetrating wound of the chest, received at Petersburg on the day previous. The ball entered below the right clavicle, an inch and a half from the sternum, and passed out through the left scapula near the middle of the inferior edge. The wound had been hermetically sealed at the field hospital by Assistant Surgeon B. Howard, U. S. A. The patient remained under his care, his peculiar method of treatment being fully adopted. Death resulted on July 7th, 1864. Assistant Surgeon C. E. Munn, 27th Massachusetts Volunteers, and executive officer at the base hospital, states, in a communication to the Surgeon General of Massachusetts: "A *post-mortem* was made, ten hours after death, by Dr. Wendell, of New Hampshire, Drs. Munn and Emery, of Massachusetts, and Storrs, of Connecticut, also present. External examination: Chest well formed; wound in front, the appearance of being closed by metallic sutures a few hours before death; the wound of exit closed by adhesive straps and collodion. Two small wounds, made by tapping, on the right side, were dressed in the same manner. The attendants report the first, made on July 3d, was between the sixth and seventh ribs, two inches back of the nipple; the other, made fourteen hours before death, between the fifth and sixth ribs. Percussion was *resonant* on the *right side;* on the left, somewhat dull. Internal examination: The ball was found to have passed through the external and upper part of the sternum, entering the pleural cavity at the junction of the first rib, thence through the upper lobe of the left lung outward, backward, leaving the cavity three inches from the spine, between the third and fourth ribs, and opening externally through the scapula. The lung on the *right* side was uninjured and healthy in appearance, except somewhat more than usual *post-mortem* congestion in the posterior portion. Left lung congested throughout and firmly adherent to the walls of the chest. Through the upper lobe was the suppurative track of the ball. No fluid was found on the *right side.* Five ounces of pus were found on the left, close upon the diaphragm, having a connection with the upper part of the lung. There was a small quantity of serum in other parts of the side. The two wounds, from tapping, were traced through the walls of the chest, into and through the *diaphragm,* into the *liver.* Remarks: First, hermetically closing the wounds did not, in this case, prevent the formation of pus. Second, paracentesis thoracis of the left side, the side containing the pus and serum, could not have reached the fluid without endangering the lung and other organs. Third, the operation performed on the right or wrong side, was an error in diagnosis, proved by the failure to obtain fluid, and by the *post-mortem* presenting a healthy condition of the parts, and was a greater error, in puncturing so important an organ as the liver. The testimony of those watching the case was that the patient, up to that time doing well, soon began to fail." The case is reported also through Surgeon George Suckley, U. S. V., medical director of the Eighteenth Corps.

CASE.—Private Miles Finch, Co. L, 2d Pennsylvania Cavalry, aged 36 years, was wounded at Todd's Tavern, Virginia, May 8th, 1864, by a conoidal ball, which perforated the right side of the thorax. He was admitted, on the same day to the field hospital of the 2d division, Cavalry Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. On May 12th, he was sent to Douglas Hospital, Washington. Stimulants were administered. Death resulted on May 23d, 1864, from asthenia. The case is reported by the operator.

CASE.—Sergeant Thomas N. Hillard, Co. H, 70th New York Volunteers, aged 22 years, was wounded at Manassas Gap, Virginia, July 23d, 1863, by a conoidal ball, which entered the right side of the thorax, one inch below the clavicle and three and a half inches to the left of the acromion process, fractured the second rib near its sternal extremity, passed directly through the lung, and emerged one inch to the right of the spinal column, opposite the spine of the scapula. The fifth rib was shattered at its superior surface, near its angle, but its continuity was not severed. He was taken to the hospital of the 2d division, Third Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. On July 30th, he was transferred to Lincoln Hospital, Washington. When admitted, the wounds had partially opened, and were ragged from the tearing out of the sutures. The patient coughed incessantly, and spat up large quantities of frothy sputa, more or less mixed with blood. Respiration was 46 per minute, and labored with extreme orthopnœa. The pulse was 96, and small. Every fit of coughing was accompanied by a profuse discharge of dark sanguinous fluid through either wound. It was evident that the attempt to permanently close the orifice had proven a failure. Acting under instructions from the Medical Director of the department the treatment already inaugurated was continued. An attempt was made to renew the coating of collodion, which was accomplished after some difficulty; but before the ether had had time to evaporate, a profuse discharge of the pleuritic fluids took place which rendered every effort at restoration impracticable. By August 5th, the discharge from the posterior wound had almost entirely ceased, while that from the anterior one continued to be large in quantity and of a purulent character. The discharge of this fluid was invariably accompanied with coughing, and always followed by an amelioration of all the rational symptoms. The hope was therefore entertained, that the accumulation of pus in the pleural cavity would be prevented, and that recovery would eventually take place; but as the necessity for repeated effort to throw off the pus became more frequent, the strength of the patient became proportionately exhausted. On the evening of August 12th, he was seized with an unusually severe paroxysm of coughing, followed by a copious discharge of pus, which flooded his person and the bedding, and reduced him to a state of syncope from which he was imperfectly aroused under the administration of stimulus, but expired in a short time. The necropsy revealed extensive deposit of lymph over the entire right lung, and one-half pint of thick empyemic fluid in the cavity. The track of the wound was closed anteriorly. The upper portion of the right lung was permeable to air. Only part of the first and the whole of the second and third lobes were impermeable and compressed. The left lung was well filled with air and weighed thirteen ounces; right lung eighteen ounces. The case is reported by Assistant Surgeon H. Allen, U. S. A.

CASE.—Sergeant Robert C. Ware, Co. E, 1st New York Dragoons, was wounded at the Wilderness, May 6th, 1864, by a conoidal musket ball, which fractured the fourth and fifth ribs of the right side, involving the lung. Assistant Surgeon B. Howard, U. S. A., hermetically sealed the wound upon the field. Being conveyed to Washington, the patient was admitted into the Douglas Hospital, on May 11th, where he suffered from traumatic pleuro-pneumonia, from which, in spite of careful treatment, he died on May 18th, 1864. The case is reported by the operator.

CASE.—Private Charles Kochendoffer, Co. E, 74th New York Volunteers, was wounded at Manassas Gap, July 23d, 1863, by a conoidal musket ball, which entered one inch and a half above and external to the right nipple, and passed upward and backward through the lung, making its exit on the dorsal aspect of the right scapula, near the outer portion of its spine. The wounds were closed by silver sutures and hermetically sealed with collodion dressing by Assistant Surgeon B. Howard, U. S. A., on the field. Being conveyed to Washington, the patient was admitted into the Mount Pleasant Hospital on July 30th, 1863, in the following condition: breathing, short and labored; pulse, 130 per minute and small; countenance anxious; cold, cadaverous skin, and every appearance of confirmed collapse. On the removal of the dressings, a profuse discharge of sanious fœtid pus occurred, which temporarily relieved the dyspnœa; but in spite of stimulants the patient sank rapidly, and died on August 1st, 1863. The case is reported by Assistant Surgeon C. A. McCall, U. S. A.

CASE.—Private Robert Baker, Co. E, 140th New York Volunteers, was wounded at Gettysburg, July 3d, 1863, by a musket ball, which penetrated the lung. He was taken to the hospital of the Fifth Corps, where the wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. The wound afterwards became open and suppurative. Death resulted on July 24th, 1863. The case is reported by the operator.

CASE.—Private Charles Horton, Co. G, 11th United States Infantry, received a gunshot wound of the lung at Gettysburg, July 3d, 1863. The wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. Death resulted on July 12th, 1863. The case is reported by the operator.

CASE.—Private Isaac T. Sperry, Co. G, 73d Ohio Volunteers, received a gunshot penetrating wound of the thorax at Gettysburg, July 3d, 1863. The wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. Death at the hospital of the Eleventh Corps, on July 5th, 1863. The case is reported by the operator.

CASE.—Private Levi Ells, Co. C, 12th United States Infantry, received a gunshot penetrating wound of the chest at Gettysburg, July 1st, 1863. The wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. The patient died on July 4th, 1863. The case is reported by the operator.

CASE.—Private W. D. Hammond, Co. F, 14th United States Infantry, received a gunshot penetrating wound of the left side at Gettysburg, July 3d, 1863. The wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A. Death resulted on July 15th, 1863. The case is reported by W. F. Breakey, Assistant Surgeon 16th Michigan Volunteers.

CASE.—Private G. W. Stevens, Co. D, 16th Michigan Volunteers, received a gunshot wound of the right lung at Gettysburg, July 3d, 1863. The wound was hermetically sealed by Assistant Surgeon B. Howard, U. S. A., at the field hospital of the Fifth Corps. Death on July 10th, 1863. The case is reported by W. F. Breakey, M. D., Assistant Surgeon 16th Michigan Volunteers.

CASE.—Private Jacob Ganner, Co. G, 16th Michigan Volunteers, received a gunshot penetrating wound of the chest and left arm at Gettysburg, July 3d, 1863. The wound was hermetically sealed, at the field hospital of the Fifth Corps, by Assistant Surgeon B. Howard, U. S. A. The patient died on July 10th, 1863. The case is reported by W. F. Breakey, M. D., Assistant Surgeon 16th Michigan Volunteers.

CASE.—Private Ambrose Weiss, Co. H, 93d New York Volunteers, aged 19 years, received a gunshot wound of the chest at Deep Bottom, Virginia, August 14th, 1864, by a conoidal ball, which perforated the right lung. He was conveyed to the field hospital of the 3d division, Second Corps, where the wound was hermetically sealed. On August 18th, he was transferred to Campbell Hospital, Washington. Death resulted on September 10th, 1864. The case is reported by Surgeon O. Everts, 20th Indiana Volunteers.

CASE.—Sergeant Peter Goldie, Co. A, 11th Massachusetts Volunteers, received a gunshot penetrating wound of the thorax at Petersburg, Virginia, September, 1864. The wound was hermetically sealed at the hospital of the 3d division, Second Corps. The patient died on September 13th, 1864. The case is reported by Surgeon O, Everts, 20th Indiana Volunteers.

CASE.—Private Earl Halbard, Co. F, 5th Michigan Volunteers, received a gunshot penetrating wound of the thorax at Petersburg, Virginia, September, 1864. The wound was hermetically sealed at the hospital of the 3d division, Second Corps. The patient died on September 16th, 1864. The case is reported by Surgeon O. Everts, 20th Indiana Volunteers.

CASE.—Private John W. Smith, Co. F, 126th Ohio Volunteers, received a gunshot wound of the left shoulder, penetrating the lung, by a conoidal ball, at Spottsylvania, Virginia, May 12th, 1864. He was taken to the hospital of the 3d division, Sixth Corps, where the wound was stitched and closed with collodion. On May 26th, he was transferred to the 3d division hospital, Alexandria. Death resulted on May 27th, 1864. The case is reported by Surgeon R. Barr, 67th Pennsylvania Volunteers.

CASE.—Colonel Daniel Chaplin, 1st Maine Heavy Artillery, aged 50 years, received a gunshot penetrating wound of the left side of the chest, at Deep Bottom, Virginia, August 17th, 1864. The wound was hermetically sealed at the field hospital of the 3d division, Second Corps. On August 20th, he was admitted to Turner's Lane Hospital, Philadelphia, where he died on the same day. The case is reported by Surgeon O. Everts, 20th Indiana Volunteers.

CASE.—Private Isaac Evans, Co. I, 30th Indiana Volunteers, received a gunshot penetrating wound of the thorax, near Marietta, Georgia, June, 1864. The wound was hermetically sealed by Assistant Surgeon W. H. Matchett, 40th Ohio Volunteers. Death resulted on June 28th, 1864. The case is reported by Surgeon J. D. Brumley, U. S. V.

CASE.—Corporal Evan Francis, Co. H, 81st Indiana Volunteers, received a gunshot penetrating wound of left side of thorax, near Marietta, Georgia, June, 1864. The wound was hermetically sealed by Surgeon S. H. Kersey, 36th Indiana Volunteers, at the hospital of the 1st division of the Fourth Corps. The patient died on June 29th, 1864. The case is reported by Surgeon J. D. Brumley, U. S. V.

CASE.—Private Samuel West, Co. K, 84th Indiana Volunteers, received a gunshot penetrating wound of thorax and scapula, near Marietta, Georgia, June, 1864. The wound was hermetically sealed by Assistant Surgeon W. H. Matchett, 40th Ohio Volunteers. The patient died on June 26th, 1864. The case is reported by Surgeon J. D. Brumley, U. S. V.

CASE —Private Thomas Hayden, Co. K, 45th Ohio Volunteers, received a gunshot penetrating wound of the thorax, at Kenesaw Mountain, Georgia, June 26th, 1864. The wound was hermetically sealed by Surgeon C. J. Walton, 21st Kentucky Volunteers. Death on June 27th, 1864. The case is reported by Surgeon J. D. Brumley, U. S. V.

CASE.—Private David Gallagher, Co. K, 14th New Jersey Volunteers, received a gunshot wound of the lung, at Locust Grove, Virginia, November 27th, 1863, the ball in its exit extensively comminuting the fourth rib. He was conveyed to Brandy Station, where the fractured part of the rib was removed by a process of exsection; the edges of the wound were trimmed and brought together very neatly with wire sutures and sealed with collodion. Death resulted on November 30th, 1863. Surgeon A. Treganowan, 14th New Jersey, who reports the case, says: "The case would, in all probability, have terminated differently, but for the great imprudence of the patient. Ten hours after the operation, feeling so 'bully,' as he termed it, he indulged in immoderate exercise, resulting in almost sudden death."

CASE.—Private Patrick Daley, Co. E, 70th New York Volunteers, received a gunshot penetrating wound of the chest at Manassas Gap, Virginia, July 23d, 1863. He was conveyed to the hospital of the 2d division, Third Corps, and Howard's treatment adopted. The case terminated fatally the same day; it is reported by Surgeon James Ash, 70th New York Volunteers, and by Surgeon C. H. Irwin, 72d New York Volunteers.

CASE.—Private W. Devausa, Co. B, 81st Indiana Volunteers, received a gunshot penetrating wound of the thorax near Marietta, Georgia, June, 1864. The wound was hermetically sealed by Surgeon C. J. Walton, 21st Kentucky Volunteers. Died June 26th, 1864. The case is reported by Surgeon J. D. Brumley, U. S. V.

CASE.—Corporal Lewis Burgess, Co. G, 86th New York Volunteers, received a severe gunshot penetrating wound of the thorax at Petersburg, Virginia, June 23d, 1864. He was taken to the hospital of the 3d division, Second Corps, where the wound was closed with silver wire and collodion. He died on June 29th, 1864. The case is reported by Surgeon O. Everts, 20th Indiana Volunteers.

Case.—Private *W. D. Thompson*, Co. I, 61st North Carolina Regiment, aged 52 years, was admitted to Chimborazo Hospital, Richmond, October 1st, 1864, with a gunshot penetrating wound of the chest; the missile entered the right side between the third and fourth ribs, four inches from the sternum, passed through the lower portion of the upper lobe of the lung, and emerged through the lower angle of the scapula. The wounds were hermetically sealed. When admitted, he was suffering from great dyspnœa; bloody saliva oozed from the angles of the mouth; pulse slow and weak; skin cold and bowels costive. Occasionally, with much effort, the patient spat clots of blood. October 2d, pain in hypochondriac region, and some tympanitis. Death occurred on October 4th, 1864. The case is taken from Confederate case book.

It is specified in all but fifteen of the foregoing forty-two fatal cases, that the lung was injured. The precise date of injury is ascertained in thirty-five instances, the seven other patients having been reported in return covering several days of fighting. The interval between the reception of the injury and death was as follows: Died on the day of operation, 3; on the first day following, 1; on the second day, 3; on the third, 8; on the fourth 1; on the sixth, 4; on the seventh, 3; on the eighth, 1; on the ninth, 2; on the twelfth, 1; on the thirteenth, 1; on the fifteenth, 2; on the eighteenth, 1; on the twenty-first, 1; on the twenty-second, 2; and on the twenty-seventh, 1; a total of 35. None of the seven other patients lived more than four days. The average of survival of the forty-two was, therefore, about a week. The complications were: fatal intermediary hæmorrhage on the second day, fracture of the scapula, extended comminution of the ribs, lodgement of balls, hæmothorax, and empyema. All, or nearly all, of the foregoing group of sixty-nine cases were submitted to the treatment by occlusive dressing on the day of the reception of the injury, or the following day at the farthest, and it would appear that the dressings were not removed in any instance in the general hospitals, unless the reopening of the wound or the necessity of evacuating extravasated fluids made some modification in dressing imperative. Viewing the group numerically, surgeons rightly appreciating the gravity of gunshot penetrating wounds of the chest will not regard the mortality as large, especially when it is considered that, in the opinion of observers presumed to be competent, nearly two-thirds of the cases were attended by injury of the substance of the lung. Twenty-seven recoveries in sixty-nine cases given, if the figures may be relied on, is a mortality of 60.8 only. But we fear that the statistical statement is open to many criticisms. Undoubtedly there are on the Pension Rolls the names of thirteen patients who recovered from alleged penetrating gunshot wounds of the chest under the treatment by hermetically sealing, and have survived their injuries from seven to nine years. Only one, Bradley (p. 501), enjoys good health. He has carried a musket ball in his chest for nearly nine years without great inconvenience. Two of the twelve other pensioners have necrosis and empyema, and interminably open sinuses; five suffer from hæmoptysis; two have partial paralysis; the others suffer from chronic cough, solidification of portions of the lung, dyspnœa, and other evidences of damage to the respiratory apparatus. Several have recently applied for increase of pension With all these disabilities they still live. Of five cases, reported as rapid recoveries (from lung wounds in each instance), there are no late histories, *J. E. Jones* and *J. Douricott* were paroled in three and eight months. Dorning and Wheeler, deserters, disappear after four months and six weeks respectively. *Branson* was furloughed in six weeks. During the brief period they remained under observation, these five cases presented very favorable illustrations of the plan of treatment under consideration. There remain of the twenty-seven reported recoveries, nine cases, two of which (Stauffer, p. 499, and Conauton, p. 502) appear to be satisfactory, while seven are open to objection. These seven are the cases of Erlee and Larkin (p. 499), Cunningham and Loll (p. 500), Peddle and Walters (p. 501),

and McAllister (p. 502). Peddle and McAllister were discharged for disability, and the other five were returned to duty in from ten weeks to six months from the date of the reception of their injuries. It is almost incredible that Dr. McCall should have sent Larkin to the ranks, knowing that he had been shot through the left lung one month before, no matter how complete his convalescence might appear; yet such is the record. Captain Peddle was discharged, and may have had the unusual generosity to waive his claim for pension; but it is so extraordinary that the six enlisted men reported to have been shot through the chest should all have failed to make application for pension, that it is difficult to avoid the conviction that either the gravity of the injuries sustained by these men was, happily, greatly exaggerated originally, or else that the men imprudently returned to duty, were killed in action, or died in captivity. In the writer's judgment, only three of the series of twenty-seven cases, viz: Bradley, Stouffer, and Conauton are authenticated as complete and permanent recoveries. The five who deserted or were paroled or furloughed were probably equally satisfactory recoveries; and there are the twelve disabled pensioners.

If twenty recoveries in sixty-nine cases were conceded, the mortality rate of 71.01 would still be too low, if it be assumed that these twenty were all examples of perforation or laceration of the lung. There is reason to believe that those signs, which, when several co-exist, afford a strong presumption of lesion of the lung, were wanting in many of the cases, and that the diagnoses given were unwarranted. There is no doubt that, in some of the cases, threatened asphyxia from hæmothorax or empyema made it impracticable to persevere in the occlusive treatment, and that the wounds were open during convalesence. The fatality of gunshot wounds really penetrating or perforating the lung is so great, that science would have been immeasurably indebted to Dr. Howard for an improvement upon ordinary methods of dealing with these serious injuries. It is obvious that such a pretension is far from having been established; it is probable that the routine application of the plan has not been unattended by disastrous results; and it is to be lamented that the numerous experiments have not even advanced our pathological knowledge.

Occlusive dressings in such wounds are not new, nor sutures, nor debridement, nor thoracentesis;* but these cavils would have been silenced had the combination of these means diminished the mortality of penetrating wounds of the chest. Unhappily, this

*HENNEN observes (*Principles of Military Surgery*, 3d ed., 1829, p. 378) that: "This immediate closure of the wound has been recently adopted by M. Larrey with success. The practice is not novel. John de Vigo, in the tenth chapter of his third book, has given an account of it; and Paré says that the practice is founded on reason and truth, if there is little or no blood poured forth into the cavity of the chest; he, however, does not close the wound for the first two or three days, to prevent accumulation of blood. La Motte closed all wounds of the chest most accurately with a tent; hence, perhaps, it is, that, in the whole course of his work, he scarcely mentions emphysema. His history of the secret dressing, which consisted in sucking out the blood, and then closing the wound, is highly worthy of notice, and is given with great fidelity in his *Traité Complet de Chirurgie*, Vol. III, p. 20, Paris edition, 1732. But Belloste seems to have done more practical good in this way than any other French surgeon. He argues strenuously and successfully against keeping the injuries of the chest open, in his *Chirurgien d'Hôpital*, and he *sets a very valuable example to writers of a more modern date*; for, in a letter in explanation of Sancassani's Italian translation of his work, he acknowledges his obligations to honest old Magatus, who wrote nearly one hundred years before him. [D. J. Larrey treats of the subject in his *Mémoires de Chirurgie Militaire et Campagnes*, T. II, p. 154, in speaking of incised wounds of the chest observed in the campaign in Egypt. Paré (*Œuvres Complètes*, T. II, p. 94, Livre 8, Chap. XXXII) has, as Malgaigne remarks, borrowed from Vigo. (The edition in the Surgeon General's Library is the Münich edition of 1521, *Practica in chirurgia copiosa*, small folio.) The allusion to healing wounds of the chest by first intention is in the first part of the third book, *fol.* LXXIV. Vigo in his turn copied from Guy de Chauliac (*La Grande Chirurgie*, composée l'an de grace, 1363). See Joubert's restoration, published at Tournon in 1619, Chap. V, p. 290. The admonition which Dr. Howard has unheeded is furnished by Belloste in his eighth chapter. Cesari Magati, professor at Ferrara, published his work "*De rara Medicatione Vulnerum*, Folio, apud Venetiis, in 1616: "*Unionem labiorum, mitem medicationem, clausum vulnus commendat.*"—(Creutzenfeld.) Paré condemns the application of stitches in penetrating wounds of the chest, in the thirty-second chapter of his eighth book, and also in the *Playes d'hacquebutes*, 1552, fol. 76. Felix Wurtz, in 1576, advanced the treatment of penetrating wounds of the chest by sewing them up as a general method. (*Practica der Wundarzney, darinn allerley schädliche Missbräuche der Wundärzte abgeschafft werden.* Aus den Handschriften des Autors, von neuen übersehen und vermehret durch Rudolph Wurtzen, Basil, 1576); Professor T. Longmore remarks that "'hermetically sealing' is only a new term;" but even this admission is erroneous; for in 1827, Graefe, of Berlin, in the case of a man of thirty-two, who had stabbed himself between the fifth and sixth ribs, near the sternum, the knife penetrating two inches, blood and air escaping freely from the wound, etc., etc., directed the following treatment: La plaie fut *hermetiquement* fermée, etc., etc. (See *Clin. des Hôp.*, T. II, No. 28, and *Arch. Gén. de Méd.*, T. XVI, p. 601)—COMPILER.]

consummation has not been attained. Additional and impressive illustrations have been furnished of the well-known facts of the great relief of dyspnœa and the arrest of hæmorrhage that sometimes, though far from invariably, follow the immediate closure of chest wounds. Paring, suture, and reunion of the lips of deep wounds have failed, as of old to promote cicatrization of the torn track out of sight, and instances have been furnished of sewing up clothing within the thorax and of tapping through the liver that are serviceable for instruction rather than imitation.

The foregoing series of cases of gunshot wounds of the chest treated by hermetically sealing probably includes all that recovered; because, if omitted on the official records, such examples would probably have found publicity through the medical press. But many fatal cases are unquestionably unmentioned. The fear of duplication has deterred the writer from citing those cases in which the names of the patient or observer were wanting, or the result left undetermined.

In the Appendix to Part I of this History (p. 200), will be found an interesting discussion, by Dr. J. S. Billings, of this mode of treatment, and of the opinions regarding it, entertained by the medical officers of the Army of the Potomac. Adopted by surgeons of the 3d division of the Second Corps, it was "regarded with disfavor by the majority of the medical officers of this Army." At Gettysburg, Dr. Billings, in charge of the hospital of the 2d division of the Fifth Corps, had under observation "six cases, in which the hermetically sealing process had been practiced by Dr. Howard. * * An assistant surgeon was left by Dr. Howard to take charge of the cases, and carry out his peculiar mode of treatment, and a written order was given by Dr. Letterman that these cases should not be interfered with. All of these men died within eighteen days. On two of them I had autopsies made, which revealed empyema and pleuro-pneumonia. In one case a fragment of a woollen shirt lay in the cavity of the chest." Dr. Billings requested Assistant Surgeon C Smart, medical inspector of the Second Corps, to report on the results of this mode of treatment in the command to which he was attached. After expressing his chragrin that his investigation had resulted in little of real importance, owing to insurmountable obstacles presented by the imperfection of the records, and the absence on duty or on sick leave of many of the surgeons of the three hospitals of the Second Corps, Dr. Smart continues:

"In the hospital of the 1st division, I have obtained positive information of the existence of only three cases of chest wounds hermetically sealed; althongh I am fully satisfied that more than this number were so treated. Even in these cases I have been nnable to obtain the names of the patients, or a statement of their condition before operation. That three cases, however, of penetrating wounds of the chest were sealed is certain; and it is equally so that this operation was followed by immediate and very marked improvement in the condition of the patients; and that they did well so long as they remained in the field hospital. What has become of them since then is unknown. The cases operated npon in this hospital were certainly not selected on account of presenting very favorable chances of recovery under ordinary treatment; the medical officers here being inclined to view the operation with an unfavorable eye; although they bring forward no facts to prove aught against it, on the contrary their experience pointing only to the relief supervening npon the completion of the sealing process, and hence patients that seemed to promise well were sedulously protected by the medical officers in charge of them from any operative interference. Dr. Howard was thns reduced to the necessity of selecting his cases for operation from those presenting such serions symptoms as to cause them to be set down as probably fatal, however treated. Yet in these cases sealing was followed by marked improvement in the condition of the patients, who did well during the short time they remained nnder observation.

"In the hospital of the 2d division, the operation has been condemned without trial. One case, I learn, was operated upon, according to Doctor Howard's method, by Surgeon Henry E. Martin, U. S. V. Relief was afforded, and two days afterward the patient was sent to City Point. No particulars are given. In the 3d division,* the operation has been practiced to some considerable extent, not so much by Dr. Howard personally, as by the medical officers of the division, who first learned the practice after Gettysburg, and have since then adopted it, in some measure. Not having any record of the cases, they cannot speak of the ultimate issue of hermetically sealing. Yet, that cases treated thus are not necessarily fatal is evidenced by the case of an officer (name not given) who, but a few days ago, exhibited to Surgeon J. Jamison, 86th New York Volunteers, the cicatrices of the sealing performed by him at a previous period. Without reference to the issue in death or recovery, this operation is practiced in order to yield the relief from dyspnœa which is invariably, in the experience of these surgeons, its immediate result. On the records, only two cases of penetrating wounds of the chest are mentioned as having been sealed. The reason given for this omission is that patients subjected to this mode of treatment are seldom brought to the operating table, and hence do not come under the observation of the recorders. Surgeon S. W. Lyman, 57th Pennsylvania Volunteers, has lately sealed up two cases—the names he does not recall:

"Case 1st.—Ball entering interval to the nipple on the left side, passed out in the neighborhood of the inferior angle of the scapula of the same side. The evidences of perforation of the lung were satisfactory. Blood was expectorated and air issued from both anterior and posterior apertures. As the dyspnœa was very distressing, it was resolved to seal, which was effected in the usual manner: The edges were first pared and then held firmly together by means of two or three sutures; a pledget of lint was kept in position over the united lips of the wound by one or two strips of isinglass plaster, and the whole coated over with collodion.

"Case 2d.—Ball entered on the outer side of the left shoulder, passed behind the head of the humerus, and, traversing the upper and back part of the axillary space, entered the chest. The aperture of exit was near the inferior angle of the scapula of the opposite side. The difficulty of breathing was extreme. The whole of the chest was emphysematous. Coagulated blood was coughed up and air issued from the wound in the right side. This wound having been sealed up by three sutures, air was discovered moving through the wound in the shoulder. The patient objected to having this one sealed, as he found, by pressing with his outspread hands upon his chest, he caused the air contained in the cellular tissue to issue from it, and so relieved, in some measure, his oppressed breathing. The opening, however, was closed up by two stitches after the air in the areolar tissue had been evacuated. In both cases the patients were relieved, and were doing well when sent shortly afterward to the rear.

"In the latter case the propriety of closing up the wound in the shoulder might readily be questioned; but I would be going beyond the scope of this report were I to attempt its discussion. Surgeon J. Jamison, 86th New York Volunteers, has sealed up, during this campaign, at least eight cases. His last operation was on June 23d, on the person of a man, Lewis Burgess, belonging to his own regiment. He was called in haste to see this man on account of distressing difficulty of breathing. The operation afforded so much relief that after it the patient, who previously had been all anxiety, laughed and joked with his comrades.† A case, where nature adopted Dr. Howard's principle with modified practice, may be mentioned. Dr. W. S. Cooper, 125th New York Volunteers, relates that while the wagons ordered to carry wounded to the rear were being loaded up, a man belonging to his regiment, whom he had previously seen and recorded as being shot through the lung, complained to him that the officers loading up the wagons would not permit him to ride, saying that he was able to walk. The wound in the chest was sealed up by a hard cake of dried clots. The man, he has since learned, is convalescent. This was a decided case of injury to the lung, for the man coughed up small clots, and these, by the way, formed his passport into the wagon. Concerning mortality after this operation, I can say but little. No medical officer in this corps has seen a case of hermetically sealed chest wound dead. Yet it is possible that some of the cases in the 3d division might have died without attracting attention; no particular care was evinced in watching the cases. In the 1st division, however, if a death had occurred, I am certain it would have been seized upon as proof sufficient to condemn the operation. From the registers of the 2d and 3d divisions, I have transcribed the names of one hundred and fifty cases of penetrating wounds not hermetically sealed; of this number, forty-nine died while in the Field Division Hospital. In

* The chief medical officers of the three divisions were: 1st division, Surgeon D. N. Houston, 2d Delaware Volunteers; 2d division, Surgeon J. F. Dyer, 19th Massachusetts Volunteers; 3d division, Surgeon Orpheus Everts, 20th Indiana Volunteers.—Ed.

† He died on June 29th. See page 506.—Ed.

this report fourteen cases* (not selected by reason of their presenting fair chances of a favorable issue) treated by sealing are recorded as having been sent to the rear doing well. It is possible that the palliation of the immediate symptoms may have something to do with this. However, more extended observation is required before any satisfactory conclusion can be arrived at upon this subject. In concluding, it may be needless to mention that the experience of those officers, in the corps, who have practiced the operation has as yet been too limited to enable them to form any idea based upon facts concerning the nature of those cases to which this operation is more particularly applicable." * * *

In the Army of the James, a strong prejudice was manifested against Dr. Howard's plan of treatment, especially by the surgeons at the base and field hospitals at Broadway Landing and Point of Rocks. Surgeon Hadley B. Fowler, 12th New Hampshire Volunteers, in his monthly report of the base hospital for July, 1864, says:

* * * "During the month ten cases of gunshot wounds of the lung died here. Of ten cases treated by Dr. Howard, of Washington, by the method of hermetically sealing the wounds in the chest and tapping to relieve effused fluid, nine died and one was sent to general hospital, the wound of exit freely discharging pus at the time he was put on the transport. The pathological results of two of his cases are reported; the other eight were examined by Dr. Howard, but results not made known to us."

Of the cases here referred to, but two have been positively identified, the case of Williams, printed on page 504, and that of Private G. W. Ryerson, 9th Maine Volunteers.† The first was and the second was not an instance of hermetically sealing. Dr. Fowler's report gives the following additional names of patients with gunshot penetrating wounds of the chest who died in the hospital under his charge about the period referred to from gunshot wounds of the chest, viz:

Private Lewis King, Co. I, 96th New York Volunteers, died July 2d, 1864.
Private Albert Attwood, Co. K, 4th New Hampshire Volunteers, died July 2d, 1864.
Private Martin Kelley, Co. I, 188th Pennsylvania Volunteers, died July 3d, 1864.
Private Albert Vickery, Co. H, 8th Maine Volunteers, died July 4th, 1864.
Private Louis Byron, Co. K, 169th New York Volunteers, died July 4th, 1864.
Private Jesse Harvey, Co. G, 76th Pennsylvania Volunteers, died July 8th, 1864.
Private James Peabody, Co. I, 9th Maine Volunteers, died July 8th, 1864.

These names probably refer to the cases mentioned by Dr. Fowler as illustrations of the disadvantageous results of Dr. Howard's treatment. The more successful case, of empyema, sent to the hospital at Fort Monroe cannot be identified from the hospital records.

Assistant Surgeon G. Derby, U. S. V., medical inspector of the Department of Virginia and North Carolina, made, on July 7th, 1864, a report to Surgeon C. McCormick, U. S. A., the medical director of the department, relative to some of these cases. Copies of the report were furnished to the Acting Surgeon General and to Surgeon G. Suckley, medical director of the Eighteenth Corps, who had supervision of the field and base hospitals of the Army of the James. The report, divested of the endorsements and other official formulæ, was as follows:

"On the 4th instant, I inspected the base hospital of the Eighteenth Army Corps and found four cases of gunshot wound of the thorax, all of which were under the immediate charge of Assistant Surgeon Benjamin Howard, U. S. A., who, although not connected with the hospital or

* In the series of cases that I have reported by name, there are fourteen of the three division hospitals of the Second Corps, including nine fatal cases.—Ed.

† An account of the autopsy in this case, in which the abdominal cavity was chiefly implicated, was published by Surgeon C. H. Carpenter, 148th New York Volunteers, in the *Boston Med. and Surg. Jour.*, Vol. LXXI, p. 112. It will be noticed farther on among the wounds involving both chest and abdomen.

corps, had special authority from Washington, as I was informed, to direct the treatment of all similar cases which might be received. The essential points of his treatment consisted in hermetically closing the wounds, and subsequently making, with the trocar, new openings for the exit of accumulated fluid. On visiting the hospital again to-day, I learned that the cases I had seen three days previously had all died. I found three other similar cases which had been subjected to the same treatment. Two of them were moribund. I also learned that in two instances, puncture of the walls of the thorax had been made by the trocar without the evacuation of fluid. I found Dr. Howard, and said to him that, as medical inspector of the department, I felt at liberty to ask for his authority to do what he had done and was still doing. His reply was that Dr. Suckley, medical director of the Eighteenth Corps, had verbally authorized him to look after these cases. One official paper was shown me dated July 29th, 1863, and signed by Surgeon J. R. Smith. It authorized Assistant Surgeon Howard, after the next battle, to take charge of cases of wounds of the thorax and abdomen. Dr. Howard, however, disclaimed any direct official authority for his present proceedings."

This report was referred to Medical Director T. A. McParlin, of the Army of the Potomac, who forwarded in reply the following report by Assistant Surgeon Howard:

* * * "I have the honor to acknowledge the receipt of a communication by G. Derby, Assistant Surgeon, U. S. V., reporting certain alleged proceedings of mine in the base hospital of the Eighteenth Corps, with endorsements from the Surgeon General's Office and from yourself. With reference to the endorsement from the Surgeon General's Office, I beg most respectfully to state that I have never at any time or place 'assumed charge of patients who have gunshot wounds of the thorax,' nor have I represented that I possessed special authority from Washington or any other source to direct the treatment of them or any other class of cases. The report of G. Derby, Assistant Surgeon, U. S. V., is a gross misrepresentation, equally ungenerous and unjust, as will appear from the following statement of facts: On June 30th, 1864, by invitation of my friend Surgeon Suckley, U. S. V., medical director Eighteenth Corps, I accompanied him on a visit to his field and base hospital. During the course of a conversation on the treatment of certain gunshot wounds of the chest by hermetically sealing, the doctor replied, 'You have a good thing there, doctor. Those cases are almost sure to die anyhow, and if there is anything which promises to be beneficial in their treatment, in any degree whatever, it ought to be tried. If I can do anything to help you in your investigations, I will be very glad to do it, &c.' I replied that if the Eighteenth Corps became engaged while the Army of the Potomac was quiet, if I had time, I would run down to take notes at least, even though I did not operate or treat any cases, &c., &c. During our visit, the doctor introduced me to the surgeons in charge of the field and base hospitals, respectively, and directed them to afford me every facility in their power to enable me to treat or take notes of cases as I might desire, so long as it did not conflict with the general arrangements. The same evening, the Eighteenth Corps became separately engaged, and on the day following, toward night, I found in the field hospital several chest wounds. I operated on one case, Private Williams, 1st Connecticut Heavy Artillery, which promised very unfavorably; also commenced to operate on Private Kelly, 69th New York Volunteers, but as he appeared unable to endure the position I desisted. There were other cases, but, as it was growing dark, I left, requesting the surgeon in charge to send my patient on to the base hospital as soon as he could, together with the other chest wounds. They were not forwarded when I called the following day, as I had anticipated, but came several hours afterward. On account of the time which had elapsed since the reception of the wounds, I gave up the idea of hermetically sealing any other case, though otherwise it might appear ever so favorable. On looking about the hospital, I found several chest cases, some of which were evidently mortal, which I found the ward surgeons were very anxious to get rid of. I saw Dr. Fowler, surgeon in charge, and stated to him distinctly that I had *one* patient, Private Williams, and *one* only, for whom I was responsible,—gave my reasons for objecting to the same plan of treatment in any other of the cases; but, as I should be visiting the hospital frequently, requested that all the cases might be placed in the same ward with my patient, my desire not being so much to operate or carry out one special plan of treatment, as to observe closely the largest possible number of cases. Eight cases were placed together with my patient in the same

ward under the immediate charge of Dr. Tennant. Before breakfast on the next morning, I had completed the *post mortems* of three of these cases; one was the case I had commenced to operate upon, as referred to, the others I had simply taken notes of. I visited the remainder daily until the 7th instant, once with Dr. Suckley, who thought my patient was doing finely under the circumstances. On each visit I took notes of the other cases, and made suggestions as to their treatment, or modified it. I was unable to visit the hospital again until the 10th instant, when, calling on Dr. Suckley, I learned he had just left General Butler's headquarters, where he was informed, by Assistant Surgeon Derby, that 'all' my cases were dead, and that he should have the fact reported to the Surgeon General, &c. I immediately went to the hospital and was informed on my first inquiry of the first surgeon I met, 'All your cases are dead.' I replied, 'I had but *one*, who, from the first, I apprehended would live but a short time,—that I was sorry the others had all died; but had feared such might be the result.' I requested to see Dr. Tennant [Assistant Surgeon Charles J. Tennant, 21st Connecticut Volunteers], the ward surgeon in charge, but found he had been ordered away on duty. I was referred to another surgeon who had succeeded him, and from him I learned that they were '*nearly all dead*.' I then visited the ward with him and the surgeon who had stated to me ten minutes before that they were all dead, when I found *three living!* two of them being more complicated than any others. I had taken special interest in them, and had modified their treatment more than that of all the others put together. In one, the liver was implicated. I had on one occasion removed about a pint and a half of fluid from the right pleural cavity, strongly tinged with bile, and subsequently about a pint of the same nature. In the other there was extensive pulmonary hernia, which I had fixed so as to secure a permanent plug with adhesions around the orifice, and also exhausted the pleural cavity of air. This, I suppose, is the case Assistant Surgeon Derby reports, in which the trochar was used without, as he had 'learned,' the removal of any fluid. Of the cases, nine in all, my patient lived till the eighth day; three of the others died on July 2d and 3d; two others, I suppose, died during my absence, and three were living on July 10th, 1864. Hermetically sealing was practiced in no case except that of my patient, Private Williams, in whom both lungs were extensively involved—the ball having entered and passed through the left scapula, below its spine, passing out about two inches below the middle of the right clavicle. I met Assistant Surgeon Derby, U. S. V., at the base hospital on the 3d and 7th instant; on neither of these occasions were any explanations elicited from me, which I deemed unnecessary under the circumstances. My presence at the hospital and everything connected with the whole affair was simply an unofficial matter between Dr. Suckley and myself, to whom I should have simply referred Assistant Surgeon Derby, U. S. V., for information. It happened, however, that, on July 7th, I had in my pocket the communication he refers to from the Surgeon General's Office, so I showed it to him, at the same time stating that it had no relation whatever to my present conduct, which was entirely without any written order or authority. I have on other occasions frequently consulted with and operated for brother medical officers in other commands than my own with the same mutual courtesy as is observed in private practice, which, so far as I know, is not forbidden by humane considerations, professional etiquette, nor by official order. I am personally responsible for my professional conduct and shall be happy to submit my original notes of cases, or in any way contribute to its investigation. I think it must be evident, however, from a view of the *facts* herein stated, not as I have '*learned*' them, but as I *know* them, that my conduct in the case has been in perfect accordance with propriety and good discipline."

The subject appears to have dropped here. Fighting was going on daily, and the attention of the higher medical authorities was occupied by very weighty affairs. The report was dated July 18th, 1864. Few cases in which the treatment in question was practiced are recorded subsequently. In March, 1865, however, Surgeon G. Derby, U.S.V., with a view to efface an impression that this was an approved method of treatment, printed a communication in the *Boston Medical and Surgical Journal*, containing the following emphatic language:

"In July, 1864, it came in my way to see six cases at one time treated in this manner at the field hospital of the Eighteenth Army Corps before Petersburg. All six promptly perished. The

verdict of army surgeons, who have tried this method, I think is unanimous. Can we not then be done with it—banish it from our books of military surgery, and let it rest with the multitude of exploded theories which have preceded it? A writer in the *London Lancet*, some time ago, clearly showed that it was unphilosophical. Experience has proved it fatal."*

Hernia of the Lung.—Writers on military surgery have regarded this as the rarest of the complications of wounds and injuries of the chest,† an opinion confirmed by the experience of late wars. Authors make two species of traumatic pneumocele, viz: *wound of the chest with protrusion of the lung*, and *consecutive pneumocele or pneumatocele*, or hernia of the lung properly so called, in which the protruding portion of the viscus is enveloped by a covering of integument and thickened pleura, or cicatricial or other adventitious tissues. Of the seven examples of hernia of the lung noted among the twenty thousand cases of chest wounds returned, five at least were of the primary variety. It is usually stated by systematic writers that these protrusions most frequently occur anteriorly and in the neighborhood of the nipple, doubtless because most of the recorded cases occurred after incised or punctured wounds, and hence at the part of the thorax most exposed to stabs. In the cases here adduced, all resulting from gunshot, the injury was inflicted low down in the chest; in five instances, at or below the ninth rib; in two, below the nipple. Hence, several of the cases were accompanied by wounds of the belly, and escape of portions of the abdominal viscera as well as the lung. It is greatly to be regretted that the observations are so imperfect as to throw little light upon this obscure subject. The exact period at which the protrusions occurred and the behaviour of the tumor in inspiration and expiration pass unnoticed, and the want of details respecting the extent and direction of the wounds detract from the value of the observations, which, had they been minutely and carefully described, would have sufficed to decide several contested points. But the vicissitudes of the battle field are not favorable to accurate clinical records, and, meagre as they are, these histories must be accepted with gratitude because of their rarity. The first case relates to a man who was captured and taken to Richmond immediately after the reception of his injury:

CASE.—Private W. A. Perrin, Co. C, 106th New York Volunteers, aged 29 years, received a gunshot wound of the left thorax, by a conoidal ball, at the Wilderness, Virginia, May 6th, 1864. He was taken prisoner and remained in the enemy's hands until August 14th, when he was paroled and conveyed, by the steamer New York, to Annapolis, Maryland, entering the First

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* Consult HOWARD, B., *Treatment of Gunshot and Penetrating Wounds of the Chest and Abdomen by Hermetically Sealing*, American Medical Times, Vol. VII, p. 156, October, 1863; LONGMORE, T., *Remarks on the recently proposed American plan of treating Gunshot Wounds of the Chest by "Hermetically Sealing,"* London Lancet, p. 5, Vol. I, 1864; HOWARD, B., *A Review of some Remarks of Professor Longmore on the Treatment of Gunshot Wounds of the Chest by Hermetically Sealing*, Am. Jour. Med. Sci., N. S., Vol. XLVIII, p. 545; DERBY, G., Surgeon U. S. V., *Gunshot Wounds of the Thorax; is the Treatment by Hermetically Sealing them justifiable*, Boston Medical and Surgical Journal, Vol. LXXII, March, 1865; OTIS, G. A., *Circular* No. 6, War Department, Surgeon General's Office, Washington, 1865, 4to, p. 22; BREAKEY, W. F., *Some Cases of Penetrating Wounds of the Chest, treated by Hermetically Closing*, Michigan Univ. Med. Jour., October, 1871, p. 466; BROWN, P. F., *Gunshot Wound of Chest Treated by Hermetically Sealing*, Confed. Stat Med. and Surg. Jour., Oct. 1864, p. 163; CHISHOLM, J. J., *Conversion of Gunshot Wounds into Incised Wounds as a Means of Speedy Cure*, Confed. Stat. Med. and Surg. Jour., p. 138, Sept. 1864; MICHEL, M., *Healing of Gunshot Wounds by First Intention*, ibid., July, 1864, p. 99; HECKER, A. R., *Boylston Prize Essay on Gunshot Wounds*, in Boston Med. and Surg. Jour., Vol. LXXII, p. 97, 1865; HAMILTON, F. H., *A Treatise on Military Surgery and Hygiene*, New York, 1865, p. 281; BILLINGS, J. S., *Report on the Treatment of Diseases and Injuries in the Army of the Potomac during* 1864, Appendix to Part I, Med. and Surg. History of the War of the Rebellion, p. 200; BRINTON, D. G., *Report of the Operations of the Medical Staff of the Eleventh Corps at the Battle of Chattanooga*, Ibid, p. 293.

† MATTHEW (*op. cit.*, Vol. II, p. 326), the accurate historian of British Surgery in the Crimea, states that "no case of hernia of the lung is reported." M. LEGOUEST (*op. cit.*, 2me 6d. p. 361) speaks of this as "*la plus rare des complications des plaies pénétrantes de la poitrine.*" Mr. BLENKINS (8th ed. of S. Cooper's Dict., Vol. I, p. 828) describes it as "one of the rare complications of penetrating wounds of the chest." HENNEN speaks of having occasionally met with herniary protrusions of the lungs caused by guns, caissons, etc., running over men. "They have been attended by no peculiar inconvenience, but have suppurated freely, and have been punctured like cases of common abscess." GUTHRIE (*op. cit.*, 5th ed., p. 499) saw at Brussels, after the battle of Waterloo, "three cases, which were not interfered with, greatly to the advantage of the patients. It is rare, however," he continues "to see a protrusion of the lung after a gunshot wound." At Waterloo, Samuel Cooper "had a patient with a protrusion of a piece of lung, four or five inches in length. The part was much bruised and could not be easily reduced. I therefore applied a ligature around its base, and cut it off. Previously, however, I made an incision in it to ascertain whether it would bleed freely, which, being the case, induced me to use a ligature. I was afterward informed by my friend Mr. Collier that the man died." DEMME (*Militär-Chirurgische Studien*, Würzburg, 1864, B. II, S. 152) claims to have seen four cases in the North-Italian military hospitals in 1859.

Ed. Stanch pinx.

J. Bien. Chromolith.

GUNSHOT WOUND OF THORAX AND ABDOMEN WITH HERNIA OF THE LUNG

Division Hospital. On December 23d, he was transferred to Camp Parole Hospital, whence he was discharged from service February 6th, 1865. Pension Examiner B. S. Sherman reports, June 23d, 1865, that the ball carried away a portion of the eighth and ninth ribs, left side, forward of their angles, resulting in hernia nearly the size of a small teacup, which it is difficult to keep in place with bandage and compress. Disability total and more or less permanent. He was still a pensioner in March, 1872.

This would appear to have been an example of consecutive pneumocele, the lung forcing the soft parts outward as their support was withdrawn by the removal of splinters and exfoliations from the fractured ribs. The report of the regimental surgeon, Dr. J. N. Freeman, and the records of the Sixth Corps hospitals, and of the General Hospital No. 21, at Richmond, and of the transport steamer New York, have been vainly searched for additional information.

The next is a very extraordinary case. The appearance of the protruded lung shortly after the accident, and of the tumor after cicatrization was complete, are illustrated by two plates:

Case.—Captain Robert S———, Co. A, 29th New York Volunteers, was wounded at Chancellorsville, on May 2d, 1863. A round musket ball, fired from a distance of about one hundred and fifty yards, entered the eighth intercostal space of the left side, at a point nine and one-half inches to the left of the extremity of the ensiform cartilage, and fractured the ninth rib. Without wounding the lung apparently, the ball passed through the diaphragm, and entered some portion of the alimentary canal. Captain S. walked a mile and a half to the rear, and entered a field hospital. On examining his wound, the surgeons found a protrusion of the lung of the size of a small orange, which they unavailingly attempted to reduce. The wound was enlarged, and still it was impracticable to replace the protruded lung. On May 3d, the field hospital, where Captain S. lay, was exposed to the enemy's fire. He walked half a mile further to the rear, and was there placed in an ambulance, and taken across the Rappahannock, at United States Ford, to one of the base hospitals. Here fruitless efforts were again made to reduce the hernial tumor, after which a ligature was thrown around its base and tightened. A day or two subsequently, the patient passed into the hospital of the 2d division of the Eleventh Corps, into the hands of Surgeon Robert Thomain, 29th New York Volunteers, who removed the ligature from the base of the tumor. A small portion of gangrenous lung separated and left a clean granulating surface beneath. On May 7th, the ball was voided at stool. On May 8th, the patient was visited by Surgeon John H. Brinton, U. S. V., who found him walking about the ward, smoking a cigar. There was an entire absence of general constitutional symptoms; no cough, no dyspnœa, no abdominal pain; the bowels were regular and appetite good. The protruding portion of the lung was carnified; there was a dulness on percussion, and absence of the respiratory murmur in a zone an inch and a half in width around the circumference of the base of the tumor. Surgeon Thomaine stated that the hernia had been gradually diminishing in volume. It was, at this date, half the size of an egg, and covered with florid granulations. On May 10th, a drawing of the parts was executed by Mr. Stauch, artist of the Army Medical Museum. (See Chromolithograph No. XI.) On June 2d, Captain S. was transferred to Washington. There was an elastic, partly reducible tumor, over which was an oval granulating surface an inch and a half by three-fourths of an inch. The vesicular murmur was perfect throughout the lung, except in the immediate vicinity of the tumor. Compression of the tumor was advised. After a furlough of sixty days, Captain S. was again examined. The wound had entirely healed; the respiratory sounds were normal; there was still a slight hernia of the lung. The general health of the patient was excellent. At this date a second drawing was executed. (See Chromolithograph No. XII.) The captain was discharged from service on June 20th, 1863, and was subsequently pensioned. On May 19th, 1864, Pension Examiner E. Swift reports the patient to be entirely incapacitated from the wound, which, at that date, was considerably tumefied. He rates his disability total and temporary. September 19th, 1865: The tumor is reported to be undiminished in size and painless. The patient can take ordinary, leisurely exercise, but is unable to run up and down stairs. He has no cough, but suffers somewhat from gastric symptoms, his stomach being easily disturbed. The extra-thoracic tumor is resonant on percussion. The air, in entering, produces a crepitant crackling sound; the expiratory murmur is feeble. March 14th, 1867: Two months ago, the tumor suddenly enlarged after straining efforts at lifting, being now five inches in its long and four and a half inches in its transverse diameter. The respiratory sounds are feeble. There is often nausea after eating, and great pain, referred to the tumor. Pressure over the tumor causes a gurgling sound, simulating the presence of air within the tumor, and borborygamus throughout the intestines. The patient declares his inability to eat meat. The contents of the tumor are not reducible; traction on it and its contents produce nausea. A portion of the stomach has undoubtedly escaped through the diaphragm, and through the opening in the thoracic walls. A bandage, so arranged as to retain the tumor within its present limits and prevent further enlargement, was applied. A letter from the patient, dated January 23d, 1870, leads us to infer that this bandage has fulfilled its indication. On January 31st, 1870, the patient was reported to have, in addition to his other troubles, a hernia of the stomach, which viscus passed up through the diaphragm and thence through the opening in the rib, so that the tumor on the left side contained both lung and stomach. He wore a compressing bandage. On July 20th, 1872, Dr. Wm. H. Romig, of Allentown, Pennsylvania, the family physician of Captain Stolpe, writes: "The hernial tumor is of a doughy consistence, its surface smooth, measures in its longest diameter four and a half inches. Stolpe says, it appears smaller at times; it cannot be reduced by taxis, neither can any communication be discovered with the internal organs. Never gives pain, but dyspnœa is produced upon hastening his pace or heavy lifting; cannot lie on his left side for same reason; cannot expand his lung fully, that is, beyond normal use. His stomach will take food often, but not much at a time; the left side of his body does not appear so strong as the right. Weighs about one hundred and sixty pounds, and enjoys good health."

In the next case nothing can be learned relative to the isochronism in the variations of volume of the tumor with the two acts of respiration:

Case.—Private George W. Bowman, Co. K, 4th New York Heavy Artillery, aged 17 years, was wounded at Spottsylvania May 19th, 1864, by a conoidal ball, which entered four inches below the left axilla, and emerged two inches to the left of the spinal column, on the same level. He was admitted to Armory Square Hospital, May 22d, 1864. Hernia of a portion of the viscera occurred from point of entrance and was ligated by Acting Assistant Surgeon D. W. C. Van Slyck. He was furloughed July 1st, readmitted August 20th, again furloughed November 23d, and readmitted January 28th, 1865. On February 2d, 1865, he was returned to duty, and mustered out September 26th, 1865. Pension Examiner W. C. Wade, Holly, Michigan, reports, November 12th, 1869: "Gunshot wound through ninth rib below left scapula, ball emerging near spine, having penetrated the abdominal cavity. Pieces of bone have been removed, and part of the omentum sloughed away; the muscles of the side are weakened. Disability three-fourths."

The next is the only case of the series in which it is expressly stated that the lung was wounded. The integrity of the displaced portion of the lung had been regarded as an almost constant condition in traumatic pneumocele, the cases recorded by Roscius and Angelo being the only exceptions. In this case, it is possible that the edge of the lobe, the part usually protruding, was uninjured, the missile perforating the deep pulmonary tissue:

Case.—Private James Infant, Co. G, 5th New Hampshire Volunteers, aged 19 years, was wounded at Petersburg, April 2d, 1865, by a conoidal musket ball, which entered just below the left nipple and emerged to the left of the sixth dorsal vertebra, penetrating the left lung. He was admitted to the field hospital of the 2d division, Ninth Corps, and thence transferred by rail to the Second Corps Hospital, at City Point, sent thence by hospital steamer to Washington, and admitted to Armory Square Hospital on April 16th. A portion of the lung, two by five inches, protruded through the wound of entrance. Death occurred from asphyxia on April 18th, 1865. The case is reported by Surgeon D. W. Bliss, U. S. V.

The next very interesting case affords an example of hernia of the liver, omentum, and lung, complications which have received little notice, probably because of the rarity of recovery from such lesions. It recalls the case recorded by Sir Thomas Bell, in Duncan's *Commentaries* (Vol. II, p. 349, 1785), of a grenadier of the 35th British Infantry, whom he saw at the military hospital at Point Levi, at the surrender of Quebec to General Wolfe:

Case.—Private B. S. Sheridan, Co. A, 9th Massachusetts Volunteers, was wounded at Malvern Hill, July 1st, 1862, by a musket ball, which entered the right side between the ninth and tenth ribs, and passed out a little to the right of the xyphoid cartilage. Soon after the reception of the injury, a portion of the lung protruded from the anterior wound, and from the posterior wound there was a constant dripping of bile. On July 4th, Sheridan walked from the ambulance station to James River, a distance of a mile and a half, with the hope of getting on board of a gunboat. He was disappointed, and was taken prisoner and conveyed to Richmond. No dressings were applied to the hernia of the lung. It was uncovered, and the patient occasionally washed it. He suffered little pain or dyspnœa, and there was an amazing absence of shock or prostration. On July 25th, the bile had ceased to dribble from the posterior wound, and the hernia of the lung had greatly receded. He was exchanged, and on July 29th admitted into the hospital at Chester, and placed under a tonic treatment. The mass of flesh was found to be muscular tissue, and was protruding to the length of two inches, and was about the thickness of the middle finger. He soon complained of severe pain in the region of the diaphragm, which was augmented by taking a full breath, and of paroxysms of coughing attended with but slight expectoration. The cough and pain in the region of the diaphragm gradually disappeared under treatment. After the protrusion had been sloughed away, the wound closed, leaving a tumor beneath the skin, in the position of what was the base of the protrusion. This tumor was slightly variable in size, but could not be reduced. About the middle of September, a movable substance was discovered, which appeared to be a portion of ball flattened on the eleventh rib, by the side of the tumor; it was determined to remove this substance, and at the same time ascertain the character of the tumor. On doing this, it was found to be an irreducible hernia of the omentum; no bad symptoms followed the operation. It appears that the ball, after striking the chest, turned downward, passed through the oblique muscles, carrying with it a portion of their tissue, and was then deflected upward to the point of exit. The peritoneum was probably wounded near the point of exit, which allowed the omentum to follow in the track of the ball, and during the time required to slough away the pendant mass, it became agglutinated in its new position, which rendered it irreducible. The patient, at his own request, was returned to duty on October 31st, 1862. Pension Examiner J. W. Foye reports, under date of April 6th, 1869, that the "ball entered the right chest on its posterior aspect at a point corresponding with the angles of the ribs and through the last intercostal space; passing forward it fractured the twelfth rib near its costal attachment, and escaped anteriorly four inches from the median line of the body, having first entered the abdominal cavity by detaching the diaphragm, to a small extent, from the ensiform cartilage. Through the opening thus made, a process of omentum has floated upward constituting a form of costo-phrenic hernia. The injury is grave but not equivalent to the loss of a hand." Under date of March 4th, 1872, the Pension Examining Board at Boston, Massachusetts, state: "There is now a hernia of the lung two inches in diameter at base at site of wound of exit. The inferior half of the lower lobe of the right lung has undergone partial consolidation from interstitial deposit, submucous crepitation, dulness on percussion, and also physical signs in hernial tumor. His general health is much impaired, and he is at present incapable of any manual labor. His disability has increased."

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The sixth case is cited by Dr. B. Howard in his report already printed (p. 513), but in such vague terms that it is impossible to identify the patient, or to determine whether the tumor was ligated or excised or reduced without operation:

CASE.—A soldier of the Eighteenth Corps received a gunshot wound of the chest, before the entrenchments at Petersburg, late in June or early in July, 1864. He was conveyed to the base hospital at Broadway Landing, in charge of Surgeon H. B. Fowler, 12th New Hampshire Volunteers. He was placed in an hospital tent with a patient, Private Williams, who was under the charge of Assistant Surgeon B. Howard, U. S. A., who took notes of this and some of the other cases of chest wounds in the ward. The only facts reported in regard to this are as follows: "There was extensive pulmonary hernia, which I had fixed so as to secure a permanent plug, with adhesions around the orifice, and also exhausted the pleural cavity of air. This, I suppose, is the case Assistant Surgeon Derby reports, in which the trochar was used without, as he had 'learned,' the removal of any fluid."

The seventh case is also wanting in essential details. It is published by Dr. F. H. Hamilton (*op. cit.*, p. 295). It is interesting as one of the few examples of traumatic pneumocele through a small orifice, and complicated by strangulation:

CASE.—A young soldier of the Fourth Corps, name not ascertained, was wounded at the engagement at Fair Oaks, May 31st, 1862. "Our attention," says Dr. Hamilton, "was called to him the night after the second battle by one of the surgeons. He had been wounded by a ball on the left side of the thorax, a little below the nipple. The ball had not been found. He was lying upon the ground in a condition of considerable prostration. The hernia was about one inch in diameter, having escaped from an aperture which was very much smaller. It was completely strangulated, being quite black, and insensible to the touch. We applied to the neck of the hernia a strong silk ligature, for the purpose of expediting its destruction, and then made fast the ends of the ligature to the outer surface of the chest by adhesive plasters, to prevent the escape of the ligature within the cavity, in case the hernia should retire after it had sloughed. We saw this poor fellow the next morning lying in the same place. He had taken a little nourishment, such as we had to give him, and expressed himself as being comfortable, although he had lain without shelter two nights, and during each night he had been drenched with rain. In this respect he suffered, however, only in common with at least two thousand other wounded and dying men. We cannot omit this additional tribute to the bravery of these noble fellows. During all this time, and we were with them every moment both night and day, there was never heard one cry of impatience or one murmur of complaint beyond that which was extorted by the agony of suffering. When the wounded were sent down to the White House, this boy was sent with them, and we have never seen or heard from him since."

Three of the seven cases, in all probability, terminated fatally. Three of the four survivors wear retentive bandages with concave pads. One has ventral hernia, and two diaphragmatic hernia, the latter verifying Guthrie's prediction (*op. cit.* p. 506) that wounds of the diaphragm will never be found to heal, but will remain open for the transmission and possible incarceration of the abdominal viscera into the chest. The probability of the incarceration and possibility of strangulation, and consequent necessity for the operation described by Guthrie, has doubtless been explained to these pensioners, with warnings to avoid muscular exertions and stooping postures. In two of the successful and one of the fatal cases, ligations were placed about the base of the pulmonary protrusions. In none of the cases was the wound enlarged or the intercostal space wedged open to facilitate the reduction of the hernia. A more particular account of the means adopted in the sixth case, in order to occlude the wound with the lung as a plug, and to exhaust the pleural cavity of air, would be interesting.

J. Cloquet[1] explains the mechanism of protrusions of the lung through a wound as follows: The expiratory muscles contracting simultaneously and suddenly on the reception of a blow, and the glottis closing, the air, unable to escape by the trachea, fills the pulmonary cells, and the elasticity of the air forces the lung against the thoracic parietes and a portion tends to escape at the weakest point. Nélaton[2] accepts this explanation, but Malgaigne[3] proposes a different hypothesis, believing that in a sudden forcible

[1] CLOQUET, *Nouveau Journal de Médecine*, 1819, T. VI, p. 328.
[2] NÉLATON, *Pathologie Chirurgicale*, T. III, p. 441.
[3] MALGAIGNE, *Traité d'anatomie chirurgicale*, 1859, T. II, p. 209.

expiration with the glottis partially closed the air in the sound lung will pass into the bronchi of the injured side, forcing the lung outward if there is a wound in the parieties. Chelius[1] and M. Morel-Lavallée[2] accept neither of these explanations. The latter has written an exhaustive memoir on the subject, which may be studied with great profit. He has collected nearly all the recorded instances prior to the publication of his paper. They number but thirty,[3] and only three of these, reported by Richerand, Cloquet, and S. Cooper, resulted from gunshot wounds.

If Guthrie's three cases, of which the particulars are wanting, occurred after gunshot,[4] and the four cases referred to by Demme, be added, and Baudens's case in Algiers, and the seven examples cited in this subsection, the number of recorded instances of pneumocele after gunshot injury still remains less than a score.[5] Fischer, in his recent admirable work on the surgical experiences of the Franco-German war, observes that he could learn of no example of this accident among the wounds of the chest observed in the Saxon and Prussian armies. There are but two affections with which hernia of the lung is liable to be confounded, viz: intercostal epiplocele, with which it may also be complicated, as in two of the cases here reported, and a pulmonary abscess or vomica approaching the surface. Careful inspection with auscultation and percussion should serve to establish the differential diagnosis; but mistakes have been committed, as in Ruysch's case.

There is but a single instance of successful reduction of a traumatic pneumocele without previous ligation, the case of Angelo.[6] A good recovery ensued, though the lung tissue was wounded. Authors generally advise gentle taxis, and some recommend the enlargement of the wound to return the tumor; but there is no evidence of the expediency of this measure. Excision or ligation were employed in most of the cases, and no bad

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[1] CHELIUS, *A System of Surgery*, American reprint of South's translation, Vol, I. p. 497.

[2] MOREL-LAVALLÉE, *Hernies du poumon* (Mém. de la Soc. de Chir., 1847, T. I, p. 75).

[3] ROLANDUS, of Parma (*Chirurgia*, T. III, Cap. 25, Venet. 1449), was the first author to report a case of traumatic pneumocele. The tumor was excised, the pedicle left in the wound, and the patient recovered. ROSCIUS next observed a case, in 1606, remarkable as following a sword-thrust between the fifth and sixth ribs, deeply wounding the lung; excision; recovery (Fabricius Hildanus, *Opera*, Obs. 22 p. 107). G. LOYSEAU (*Observations médicinales et chirurgicales*, p. 25, Bordeaux, 1617) relates an example, the result of a pike-stab between the third and fourth ribs—reduction after excision. RHODIUS, of Padua (*Observationum medicinalium Centuriæ* III, 8 vo., Padoue, 1657), cites a case caused by a large sword wound in the side, with recovery after excision. A canula was left in the orifice. When this was discontinued the wound closed. NICHOLAS TULPIUS, of Amsterdam (*Observat. Medicæ*, T. III, p. 124, 3 ed. 1672), described a large hernia of the lung weighing three ounces, which he ligated and excised five days after the patient had been stabbed in the chest. The protrusion did not appear till the third day after the wound was inflicted. RUYSCH (*Obs. anatomico-chirurgicarum Cent.*, Obs. 53, p. 70, Amstelodami, 1691) records a traumatic pneumocele mistaken for an epiplocele and successfully ligated. BELL, of Cork, describes (Duncan's *Medical Commentaries*, 1785, Vol. II, p. 349) a large pulmonary hernia protruded through a stab in the right side, between the ninth and tenth ribs. Strangulation ensued and gangrene; but the patient ultimately recovered. SABATIER (*Médicine Opératoire*, T. I, p. 206, 2d ed., 1810) mentions a case following a bayonet thrust. Consult also on this subject: BOYER, *Traité des maladies chirurgicales*, 5me éd., T. V., p. 619; HENNEN, *Principles of Military Surgery*, 3d ed. p. 376; GOBIL, *Du méeanisme de la réspiration; quelques mots sur les plaies de poitrine, les causes de l'emphysème et sur celles des pneumocèles*, Thèse de Paris, 1858, No. 10; JARJAVAY, *De l'influence des efforts dans les maladies chirurgicales*, Paris, 1847; RICHET, A., *Traité pratique d'anatomie médico-chirurgicale*, Paris, 1857; VERGNE, *Hernie du poumon*, 1815, Thèse de Paris, 106; GRATELOUP, *Journal de Vandermonde*, T. 53, p. 416; THYLLAYE, *Traité des bandages et appareils*, 3me éd., Paris, 1815; RICHERAND, *Nosographie et Thérapeutique chirurgicales*, T. III, p. 300; RICHTER, *Chirurgisch Bibliotek*, B. III, S. 138; MERCIER, *Journal général de médecine*, T. 34, p. 378; BOERHAAVE, in DE HAEN, *Institutiones pathologicæ*, T. I, Par. 712. p. 333; PLATER *Observationes*, p. 96; BERTHE, *Journal de Sédillot*, T. XVII, p. 61; LARREY, H., *Bulletin de la société de chirurgie*, T. VI, p. 521; and CASPAR'S *Woehensehrift* for case of Scharf, 1845, No. 9; BAUDENS, *Clinique des plaies d'armes à feu*, Paris, 1836, p. 247; VELPEAU, *Comptes Rendus de l'Acad. des Sci.*, 1844; HUGUIER, *Mem. de la. Soc. de Chir.*, T. I, p. 194. FISCHER, H., *Kriegschirurgische Erfahrungen*, Th. I, S. 124, Erlangen, 1872; LARREY, D. J., *Mém. de Chir. Mil.*, T. III, p. 91.

[4] I have searched in vain through Guthrie's work on gunshot wounds, his monographs and lectures, for some additional information to that in the *Commentaries* regarding the three cases of pneumocele he saw at Brussels. Thomson alludes to one of them, in his *Observations after Waterloo*, p. 92.

[5] No allusion has been made to the *Congénital* and *Spontaneous* varieties of hernia of the lung, on which CRUVEILHIER (*Anat. Path.*, Liv. XXI, p. 1), CLOQUET (*Nouv. Jour. de Méd.*, T. VI, p. 309), and H. H. SMITH (*Principles and Practice of Surgery*, 1863, Vol. I, p. 499) have treated, as these are foreign to the present subject. Professor Smith has observed two cases of spontaneous pneumocele, remarkable for their bulk and facility of reduction. He states very positively that their volume enlarged on inspiration. A very interesting case of hernia of the lung, following an incised wound of the left chest, is reported by Dr. T. B. Hale, of Minersville, Pennsylvania, in the *Philadelphia Medical Examiner*, February, 1855, p. 75. A segment of lung, six by two and a half inches, was removed. There was neither cough nor dyspnœa. A rapid recovery ensued. The specimen is preserved. The protrusion is alleged to have *expanded during inspiration*. The same allegation is made in regard to the behavior of a protrusion of the lung in a case of wound of the liver and diaphragm, which will be reported farther on. We must believe that these statements of the augmentation of the tumor being synchronous with inspiration were all founded on faults of memory or errors of observation. Indeed in Dr. Hale's case the protrusion only appeared in coughing.

[6] ANGELO, *Gazetta medica di Milano*, February, 1844.

results appear to have followed these operations. Non-intervention is probably the safer precept. After a while the protrusion contracts adhesions with the walls of the thorax and occludes the opening.

HÆMORRHAGE.—Notwithstanding the remarkable manner in which the large vessels often escape injury from missiles entering or traversing the thorax, eluding them by resiliency or sometimes deflecting them in their passage, bleeding is the most common and the most fatal of the complications of gunshot wounds of the chest. It may arise from lesions of the larger arteries supplying the parieties,[1] from wounds of the primary carotids and subclavian; of the venous and arterial brachio-cephalic trunks; of the aorta and superior vena cava and azygos vein; of the pulmonary vessels; of the internal mammary and intercostal artery; and also from laceration of the pulmonary parenchyma and from wounds of the heart. Many of these injuries are either instantaneously mortal, or the partial or temporary recoveries are regarded as surgical curiosities. Those that are in some degree amenable to treatment are therefore invested with the greater interest, and demand all the surgeon's solicitude and skill. The experience acquired in the late war has added to our knowledge of some of the rarer forms of these lesions, and served to indicate and corroborate what apparently are the sounder of the conflicting views as to their treatment.

Wounds of the Aorta and Cavæ.—No instance has been found upon the returns of a wound of the arch or thoracic portion of the aorta;[2] if any such cases occurred, the patients did not survive long enough to receive hospital treatment. This curious exemption from injury cannot depend exclusively upon the resiliency of the arterial coats, for the Army Medical Museum contains two specimens[3] of gunshot injuries of the abdominal aorta, in one of which the trunk is fairly perforated by a pistol ball. Since the war, Acting Assistant Surgeon W. J. Piper,[5] has reported an accidental pistol-ball perforation of the arch of the aorta. The wounded soldier lived long enough to be carried across the parade to the post hospital at Baton Rouge. The specimen was not received at the Museum. Surgeon J. A. Lidell,[4] U. S. V., has recorded a case in which he made an autopsy upon a man shot by a pistol ball, which entered at the junction of the cartilage of the third rib and the sternum, grazed the left lung, and perforated the aorta just without the semilunar valves. The pericardium was filled with coagulated blood, and there was copious extravasation in the pleural cavities. The course of the ball was altered somewhat by grazing the lung. It was deflected slightly to the right. Death was instantaneous. Dr. J. B. White[5] mentions a case of bayonet stab causing a small puncture in the aorta a few lines without the pericardium. The profuse hæmorrhage was promptly fatal.

[1] Surgeon A. B. Crosby, U. S. V., records (*Appendix to Part I*, p. 11) a serious case of intermediary hæmorrhage (tenth day) from a gunshot wound involving the external mammary (*thoracica longa*). Acting Assistant Surgeon H. M. Dean gives a fatal case of secondary hæmorrhage from the left subscapular. The specimen, preserved as a wet preparation, is numbered 2835 of the Surgical Section. The artery sloughed twenty-five days after the passage of a musket ball through the axilla. Private F. M. D——, Co. D, 35th North Carolina Regiment, aged 27 years. Wounded at Petersburg, June 16th, 1864. Bleeding arrested by pressure and Monsel's salt, July 10th; fatal recurrent hæmorrhage on July 12th, 1864. Examples of ligations of the long thoracic and of branches of the circumflex arteries are given in Section III of this Chapter.

[2] It is well known that the annals of surgery contain a few such examples. GUATTANI (*Auctorum Latinorum de Aneurismatibus Collectio*, Roma, 1745) records the case of a man who survived for eight years an incised wound of the arch. PELLETAN describes (*Clinique Chirurgicale*, Paris, 1810, T. III, p. 241) the case of a man who lived two months after a puncture of the aorta near its origin by a foil. HEIL (Henke's *Zeitschrift*, 1837, B. II, S. 459) details a case in which a patient lived twelve months after receiving a stab in the ascending aorta. GREEN, T. M., of Macon, Georgia, publishes (*Southern Med. and Surg. Journal* 1855) an account he had from Dr. J. B. Wiley, "a competent and reliable observer," of an autopsy of a man stabbed, a month previously, by a narrow blade, near the origin of the aorta in front. In the *Journal de Médecine*, T. XLVI, p. 435, is a similar history, of a man who survived six days. LEROUGE has inserted in Saviard's *Observations Chirurgicales*, which he edited, a similar case, the patient living eleven days. Cases of rupture of the aorta from external violence have been recorded by MORGAGNI (*De Sedibus et Causis, &c.*, Patavii, 1765, Ep. LIII), LAURENCIN (*Arch. Gén. de Méd.*, T. VI. p. 301), ST. LEGER (*Montpelier Thèses*, MS., quoted by Bérard), and a specimen of this lesion is preserved in the Museum of St. Bartholomew's Hospital.—ED.

[3] *Specs.* 910 and 4085, Sect. I, A. M. M.

[4] *Surgical Memoir on the Wounds of the Blood Vessels*, New York, 1870, Case XLIX.

[5] Circular No. 3, S. G. O., 1871, *A Report on Surgical Cases*, etc., pp. 35 and 99.

The following is one of the few examples of gunshot wound of the descending cava:

Case.—The body of Private John M. Frey, Co. D, 1st Maryland Potomac Home Brigade, was brought to the hospital at Frederick, Maryland, May 21st, 1864, for burial. He was said to have been shot by a cavalryman in the town in self-defence, Frey having assaulted him, demanded his money, and shot at him twice, whereupon the cavalryman fired upon him. A great stream of blood is said to have gushed from his mouth as he fell forward dead. Necropsy: The ball, supposed to have been from a pistol, entered three-quarters of an inch to the right of the middle line in front, at the edge of the sternum, between the first and second ribs, between the pleural sacs, in the mediastinal space, pierced the vena cava descendens, one inch above the base of the heart, passed thence through the right side of the right bronchus, severing three rings immediately opposite the point of bifurcation of the trachea, and thus opening a direct communication from the vena cava into the trachea (giving ready exit to a large stream of blood), thence backward and a little downward, perforating the right pleural cavity, and emerged between the seventh and eighth ribs, grazing the lower border of the seventh, one-quarter of an inch from the spinal column. The lung was not wounded. The loss of blood was the cause of death, which was nearly instantaneous. There was a little clotted blood in the areolar tissue beneath the sternum. Acting Assistant Surgeon John H. Bartholf reports the case.

Acting Assistant Surgeon J. B. White[1] has reported, since the war, a remarkable instance of this lesion. A musket ball passed through the stock of the musket of the deceased, entered the second right intercostal space, divided the superior cava, traversed the chest diagonally beneath the aorta, emerged through the third left intercostal space, shattered the left humerus, and was found in a battered state, thirteen feet from where the wounded man fell. There was scarcely any hæmorrhage externally. The left pleural cavity contained a large amount of serum, with jelly-like clots. The hæmorrhage seemed due exclusively to the division of the descending cava. The patient survived long enough to be carried from his post to the hospital close at hand.

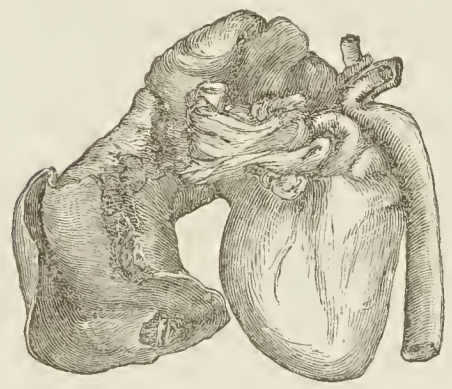

Fig. 239.—Heart, great vessels, and portion of lung perforated by a musket ball. *Spec.* 5567, Sect. I, A. M.M.

In the same report (p. 146) Assistant Surgeon S. M. Horton, U. S. A., relates the case of a soldier of the Eighteenth Infantry, with an arrow wound of the descending vena cava. The steel point of the weapon, entering at the junction of the sternum and the first right rib, penetrated three inches downward and inward, cutting the margin of the upper lobe of the right lung and inflicting a wound an eighth of an inch in length in the superior cava, just without the pericardial sac. Although scalped and suffering from other wounds, the unfortunate man survived over forty hours. Large masses of coagula were found in the thoracic cavity.

Wounds of the Innominata.—Two examples of gunshot injury of this trunk may be inserted here, and another, of a conoidal musket ball embedded between the innominata and the descending cava within the pericardium, will be recorded with wounds of that membrane:

Case.—Private Frederick Smith, Co. A, 134th New York Volunteers, aged 20 years, was wounded at the battle of Gettysburg, Pennsylvania, July 1st, 1863, by a rifle ball, which entered above the right clavicle, passed under the sternum, and emerged between the fourth and fifth ribs. He was treated at the Eleventh Corps Hospital, at Gettysburg. On July 22d, hæmorrhage took place from the arteria innominata, for which compression was applied. Death followed on July 25th, 1863. The case is reported by Surgeon James A. Armstrong, 75th Pennsylvania Volunteers.

Case.—Private William A. J———, Co E, 7th West Virginia Volunteers, aged 26 years, was wounded in the engagement on the Weldon Railroad, October 27th, 1864, by a conoidal musket ball, which entered at the right upper angle of the sternum, passed under the clavicle, and lodged in the thorax. The wound was plugged with lint, and the wounded man was conveyed to City Point, and thence, on an hospital steamer, to Washington, where he was received at Emory Hospital. On October 30th, he was kept quiet, with a simple dressing to the wound. On the 31st, he was placed under the influence of chloroform, and an exploration was made for the ball, which led to a profuse hæmorrhage. Plugging the wound was the only

[1] Circular No. 3, S. G. O., 1871, *A Report on Surgical Cases*, etc., p. 34.

alternative. Afterwards a compress and bandages were applied. On November 1st, the patient suffered greatly from dyspnœa caused by hæmothorax. The blood effused in the mediastinum appeared to compress the trachea. He died on November 2d, 1864, five days after the reception of the wound. The autopsy was made by Surgeon N. R. Moseley, U. S. V., in charge of the hospital. The ball was found resting against the innominata, having ruptured its coats and produced a diffused aneurism. The opening in the innominata is oval, nearly half an inch long, and is situated on the front part of the vessel, a little way below the bifurcation into carotid and subclavian. The specimen was contributed to the Army Medical Museum by Surgeon Moseley, and is No. 3410 of the Surgical series. The clinical notes were furnished by the ward Surgeon, Dr. C. B. McQuesten.

Wounds of the Subclavian Artery and Vein.—Wounds of these great blood-vessels occasionally come under the surgeon's treatment. It is quite time that the dictum of Jourdan* that surgery is powerless in lesions of arteries within the cranial, thoracic, and abdominal cavities should be expunged from the text-books. At least five cases occurred during the late war, of wounds of the subclavian in which surgical intervention was justifiable, and in one of these, the left subclavian was successfully tied by a Confederate surgeon, for a wound of the vessel where it passes across the first rib. Though such lesions are immediately mortal in the majority of cases, there are instances in which the bleeding is delayed or arrested, the laceration of the artery being obstructed by a spicula of bone, or by the missile or a fragment of clothing or other foreign substance. In such cases, audacity is the part of prudence:

Case.—Private John J. T———, Co. A, 122d New York Volunteers, was admitted to the field hospital of the Sixth Corps, September 20th, 1864, with a gunshot wound of the right side of the neck, received the day previous at Winchester, Virginia. When admitted he was very weak from hæmorrhage from wound and hæmoptysis. The wound was plugged and water dressings applied; anodynes and nutritious diet administered. The hæmorrhage and hæmoptysis continued; the right side of the chest became enlarged and the breath fetid. Death resulted October 5th, 1864. Necropsy: A minié ball entered the inferior triangle of the neck, right side, fracturing the first rib obliquely at its middle portion, depressing the sternal portion into the apex of the right lung; the dorsal fragment projected upward with a sharp pointed extremity, which perforated the subclavian artery in the second part of its course. The ball then emerged above the spine of the scapula. The mediastinum and the right pleural cavity were filled with blood. The right intercostal spaces bulged outward. The heart was forced over to the left. The right lung was collapsed. There were traces of periosteal inflammation on the anterior surfaces of both portions of the rib. The appearances of the artery, well represented in Fig. 241, indicated that the laceration had been produced either at the time of impact of the missile, or by some sudden movement of the shoulder, rather than by gradual attrition. The rib is drawn half size in Fig. 240. The specimens were presented by Acting Assistant Surgeon W. Leon Hammond.

Fig. 240.—Oblique gunshot fracture of right first rib. *Spec.* 3376, Sect. I, A. M. M.

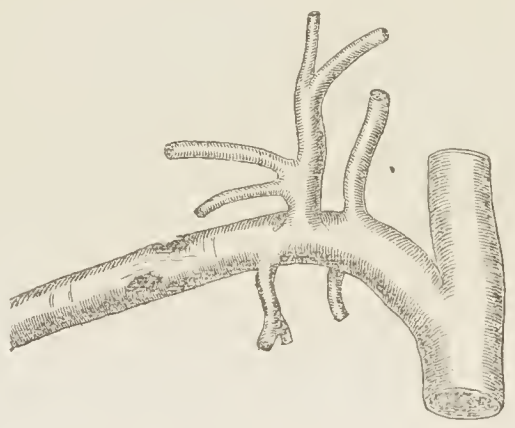

Fig. 241.—Perforation of right subclavian by the sharp point of a fractured first rib. *Spec.* 3377, Sect. I, A. M. M.

This patient survived the lesion of the artery sixteen days. That the difficulties to be encountered in an attempt to ligate the subclavian under such circumstances as these are very great, is illustrated by the following case; that they are not absolutely insurmountable, especially if the left subclavian is the seat of injury, is shown by two cases recorded in the next Section:

Case.—Private Levi Reglea, Co. D, 16th Pennsylvania Cavalry, aged 25 years, by occupation a farmer, was admitted from field hospital, City Point, Virginia, on August 16th, 1864, with a gunshot fracture of the clavicle, first rib, and scapula. The ball entered the right chest one inch from the sternum, and immediately over the clavicle, passing through and splintering it badly, slightly fracturing the first rib, thence through the right scapula, and lodged beneath the infra-spinatus muscles, one inch below the middle of its spine, where it could be distinctly felt. When admitted, his general health was excellent—although anæmic from the loss of the blood which occurred immediately after the injury—and the wound apparently doing well; both the

* *Dictionaire des Sciences Medicales*, T. II, p. 317. "La chirurgie est impuissante contre les lesions des artères placées dans l'énterieur du crâne, de la poitrine et du bas-ventre. Ces lésions sont essentiellement mortelles, à cause de l'hémorragie effrayante qui s'ensuit, et qui ne tarde pas, à épuiser les forces du malade; car les blessures des artères, loin de s'oblitérer d'elles-mêmes, tendent toujours à s'agrandir par l'effort latéral du sang, et par le déchirement des fibres de la tunique musculeuse."

power of motion and sense of touch were wanting in the arm of the wounded side, thus indicating that there was serious injury to the brachial plexus, which was further confirmed by frequent complaint of sharp, shooting pains extending down the arm and forearm to the finger ends. It was also noticed that the pulse was entirely wanting at the wrist, nor could there be any pulsation of the brachial artery, indicating that there was some serious injury or obstruction to the subclavian artery. Ordered water dressings, tonics, and a good nutritious diet. On September 1st, several spiculæ of bone were removed from the wound, which continued to do well up to half-past seven o'clock P. M on September 7th, at which time there was a profuse hæmorrhage from the subclavian artery, by which the patient lost fifteen or twenty ounces of blood in a few seconds. Upon arriving at the bedside, the hæmorrhage was found perfectly controlled by the nurse, to whom I had given explicit instructions as to the manner of making compression, in case hæmorrhage occurred. A consultation was immediately called, and it was decided to make digital compression until morning. Accordingly, the acting medical cadets were detailed to perform this duty; relieving each other hourly. The patient rested comparatively well during the night; in making the changes there was no blood lost; stimulants were freely administered. At fifteen minutes before twelve in the morning, a consultation was again held, when it was decided to ligate the subclavian artery in the second third. Acting Assistant Surgeon Walter F. Atlee, U. S. A., consulting physician, operating. An incision was made, but, owing to the condition of the parts, the artery could not be found. During the operation all compression was removed, but there was not the least hæmorrhage. After the operation the patient's body was cold; the skin moist, with a cold, clammy perspiration; the tongue clean and smooth, and of a leaden hue; the nails bluish; pulse 112, and very weak; the patient being apparently in a moribund condition. The cadets were again detailed to administer stimulants and to watch, and, in case of hæmorrhage, to make compression. Observations by Acting Assistant Surgeon M. J. Grier, who administered an anæsthetic consisting of four fluid ounces of sulphuric ether and two of chloroform: "Pulse, at commencement of ætherization, 112, irritable, quick, and feeble, rapidly rising to 130, and becoming quick, thready, and almost impereeptible under the application of the anæsthetic; but upon the removal of which returned to its former condition. Sometimes, when the administration was prolonged, it reached the frequency of 160—always falling below 115 in a few seeonds after the admission of the atmosphere. He was very susceptible to its influence, and was very easily controlled by the occasional application of the sponge. Toward the close of the operation, it was deemed advisable to administer brandy, under which the pulse changed from 115 to about 100, gaining in strength and volume." One hour after the operation, there was considerable reaction; the pulse 98, general expression better, and the body much warmer. Later in the afternoon the pulse fell to 95, gaining in volume and strength under the influence of the stimulants. At a quarter past five in the afternoon, the hæmorrhage recurred, the patient loosing about the same amount as at first—in a few seconds—before proper compression could be made. The second hæmorrhage left him exceedingly weak, the pulse scarcely perceptible, the countenance blanched, the extremities cold, beaded perspiration standing on the face; very restless; thirst urgent; the mind clear until five o'clock on the morning of the 9th, from which time he began to sink rapidly, without any further loss of blood, and died at eight o'clock. Autopsy elicited the following facts: The clavicle was perforated and badly fractured; the first rib slightly fractured just outside of its tubercle; the scapula perforated one inch below the middle of its spine; the subclavian artery lacerated by the passage of the ball as it crossed the first rib, and quite a number of spiculæ of bone were driven into it, plugging it up entirely for nearly two inches; the injured part was in a sloughing condition, and the inflammation even extending to within the innominata, thus rendering it evident that the ligation of the subclavian in its second third would have been fruitless. The condition of the artery and surrounding parts accounted for the failure to find the artery, as well as the absence of pulsation. It was also found that the brachial plexus was injured, which accounted for the loss of power and the pain extending down the arm and forearm. All the other organs were normal in structure and perfectly healthy. The case is reported by Acting Assistant Surgeon A. A. Smith.

In the next case, the patient survived the injury for two days. It was believed that the subclavian vein was injured. The lesion was on the right side, and it was apprehended that any attempt to remove the plug of lint with which the perforation was tamponned would be instantly fatal, and that the wound approached the innominata so closely that the possibility of placing a ligature on that trunk alone admitted of discussion:

Case.—An unknown soldier was wounded at Antietam, September 17th, 1862, by a conoidal musket ball, at short range. The missile entered at the junction of the inner third with outer two-thirds of the right collar-bone, made a clean perforation in the anterior wall of the bone, and largely splintered the posterior portion, and emerged above the right scapula. The wounded man was carried to the field hospital at Keedysville. On admission, he was speechless, and in a fainting condition from loss of blood. The track of the wound was plugged with lint saturated with the solution of the persulphate of iron. The usual restoratives were cautiously administered, and the strictest quiet enjoined. On September 19th, 1862, a deluging hæmorrhage occurred, and the patient almost immediately expired. It was found that a spicula of the clavicle had transfixed the left subclavian. The artery was not preserved. The clavicle, represented in Fig. 242, was presented to the Museum by Assistant Surgeon S. A. Storrow, U. S. A.

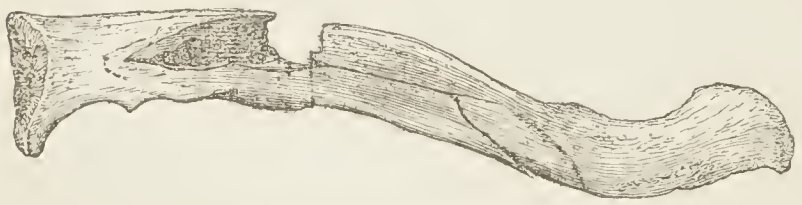

Fig. 242.—Longitudinal gunshot fracture of the right clavicle. Posterior view. Reduced one-half. *Spec.* 137, Sect. I, A. M. M.

The case by Dr. O'Keefe, recorded on p. 479, of recovery after alleged "undoubted severing of the left subclavian," will be regarded by few as incontestable. The absence of pulsation in the brachial is explicable by embolism of the axillary.

Wounds of the Internal Mammary Artery.—Ballingall[1] tells us that hæmorrhage from this vessel "is exceedingly difficult to detect or to control," and that he has "seen more than one instance of fatal bleeding from this source." Guthrie,[2] whose opinions on every subject connected with the surgery of the arteries are justly received with the most respectful attention, is very facetious at the expense of the "theoretical surgeons" who have occupied themselves with inventions for suppressing this form of bleeding, which, it is consolatory to know, is very rare,—the master informing us in the next sentence that he has never seen a distinct case of it. It will be safer to follow the advice of those who have had to contend with such lesions, and to seek for such information on the subject as further experience may afford. Only five or six cases are found on the records, in which wounds of the internal mammary were distinctly recognized. Three of these were treated by compression and styptics and two by ligation. But there are many other recorded instances of wounds near the edge of the sternum, with hæmorrhage yet without hæmoptysis, in some of which the existence of this lesion may fairly be suspected. As it was fatal in the five cases in which it was detected, it merits serious attention:

Case.—Private John B———, Co. D, 51st Illinois Volunteers, aged 20 years, was wounded at Dallas, Georgia, June 3d, 1864, the ball entering over the left side of sternum, near the junction of the second rib, and emerging above the clavicle, fracturing the sternum and clavicle. He was promptly conveyed to the hospital of the 2d division, Fourth Corps, and, on June 20th. was transferred to Hospital No. 8, Nashville. When admitted he was very feeble; pulse small and rapid; cough very severe; pneumonia of both lungs. Expectorants and opiates were given, and the patient improved until July 8th, when colliquative diarrhœa and sweats set in, followed, on the 10th, by severe and profuse hæmorrhage from the external wound. The patient was much reduced by profuse suppuration and pleuro-pneumonia when the hæmorrhage occurred, and was considered so near death that it was dangerous to give anæsthetics or attempt an operation. The opening from which the blood escaped was plugged with lint soaked with solution of persulphate of iron. The hæmorrhage was controlled, but the patient sank and died in twelve hours. Necropsy: Lungs greatly engorged. The sternum was fractured transversely at junction of middle with upper third. The synchondro-sternal articulations of first and second ribs were torn asunder; sterno-clavicular articulations disarticulated; sternal end of clavicle fractured. The fractured end of the sternum was crushed and jammed into the anterior mediastinum. The arch of the aorta, arteria inominata, right subclavian and carotid, and also the left, were all *in situ*, without perforation; but the internal mammary was found in the mutilated muscular tissue with its mouth gaping; the hæmorrhage evidently occurred from the last mentioned vessel. The specimen of fracture of the clavicle and sternum was preserved and is represented in the cut, Fig. 243, as sent to the Museum. The middle portion of the clavicle was excised, probably *post mortem*, as there is no record of any operation during life, but, on the contrary, a statement that it was thought inexpedient to undertake one. Necrosis had begun to invade the inferior portion of the fragment of the sternum, which had been crushed into the anterior mediastinum. The specimen of the wounded artery was, unfortunately, not saved. The osseous preparation was presented by Acting Assistant Surgeon R. T. Higgins.

Fig. 243.—Necrosed fragment of the sternum and portion of left clavicle after gunshot fracture. Reduced to one-third. *Spec.* 3760, Sect. I, A. M. M.

Case.—Private Ephraim Guyer, Co. D, 151st Pennsylvania Volunteers, aged 26 years, was wounded at Gettysburg, July 1st, 1863, by a conoidal musket ball, which fractured the humerus and passed along the clavicle and lodged behind the edge of the sternum, upon the internal mammary artery. He was treated in the field hospital until the 18th, when he was conveyed to the hospital at York, Pennsylvania, where he entered on August 23d. There was sloughing of the internal mammary artery which gave rise to intermediary hæmorrhage to the amount of thirty ounces. Cold applications and compresses were applied. The case terminated fatally on August 24th, 1863. Surgeon H. Palmer, U. S. V., reports the case.

The following case probably relates to a lesion of the internal mammary, as that is the only branch of the subclavian in the immediate vicinity of the wound described:

Case.—Private Colby Shrader, Co. I, 17th Kentucky Volunteers, was wounded at the battle of Shiloh, April 7th, 1862, by a musket ball, which passed through the right arm into the thorax, lodging on the pleura. He was treated at the general hospital at Mound City, Illinois. On April 17th, hæmorrhage set in from a branch of the subclavian artery. Professor S. D. Gross tried to ligate the bleeding vessel, but failed. The patient died on the following day. The *post-mortem* examination revealed a *cul de sac* within the pleura filled with blood. The case is reported by Surgeon E. C. Franklin, U. S. V., and Surgeon H. Wardner, U. S. V.

1 Ballingall, *Outlines of Military Surgery*, 5th ed., London, 1855, p. 330.

2 Guthrie, *Commentaries, &c.*, already cited, p. 517.

The next case was communicated by Surgeon W. Clendenin, U. S. V., to Dr. John A. Lidell, and is published by the latter in his valuable memoir on wounds of the blood-vessels:[1]

CASE.— "—— ——, Co. A, 45th Illinois Volunteers, was wounded at the battle of Mission Ridge. The ball struck the edge of the sternum obliquely near its junction with the cartilage of the fourth rib, and emerged from the side of the thorax between the third and fourth ribs, a little more than three inches external to the orifice of entrance (on the left side). The wound extended through the parietes of the chest without injuring the lung or pericardium. For two or three minutes the hæmorrhage was somewhat profuse, but it ceased spontaneously; the degree of shock was severe. After the hæmorrhage had ceased, the man was transferred, in an ambulance, to hospital at Chattanooga. For ten days the case progressed favorably (the wound looked well, but it was thought that the patient was scorbutic), with every prospect of recovery; but while the patient was in the act of drinking water, coughing was excited, and hæmorrhage supervened. Efforts were made by the attending surgeons to arrest the bleeding, by means of styptics, compression, etc., but without success. No attempt was made to place a ligature upon the vessel. The patient died from exhaustion on the night of the twelfth day after he was wounded. There were no positive evidences of internal hæmorrhage. *Post-mortem* examination made twelve hours after death. A small piece of bone had been gouged out of the edge of the sternum; no fracture of sternum or ribs; pleura costalis cut through to the extent of nearly one inch; internal mammary artery severed; plura pulmonalis and lung uninjured. *The pleural cavity contained a clot of blood weighing eighteen ounces.* Is it not highly probable that ligature of the internal mammary artery would have saved the life of the patient, as a ligature of that vessel was practicable, and the attending circumstances favorable?"*

Dr. Lidell, who has studied the subject of traumatic hæmorrhage with great care, and whose observations on what he aptly designates as "battle-field hæmorrhage" I have frequent occasion to cite, makes the following comments on this case:

"I believe that the question raised above by Dr. Clendenin, should be answered affirmatively. And why, let me ask, was the vessel not searched for and tied when the secondary hæmorrhage occurred, in this case? The reply to this inquiry is contained in the report of the case, and is clothed in these words: "Efforts were made by the attending surgeons to arrest the bleeding by means of styptics, compression, etc., but without success." The truth of the matter is that inefficient means were employed for the purpose of arresting the hæmorrhage in this case, and the means that might have proved effectual in controlling it were utterly neglected. The only effect which appears to have been produced by the use of styptics and pressure, was to cause the blood to flow internally instead of externally, and thus to accumulate in the pleural cavity. At the same time the secondary hæmorrhage must have been profuse, for it made its appearance on the tenth day, the patient died on the night of the twelfth, and, on making an autopsy, a coagulum weighing eighteen ounces was found in the pleural cavity. It would have been well for this patient if such agents for the relief of secondary hæmorrhage, arterial in character, as styptics and pressure had never been heard of, for then the attending surgeons would have been compelled to search for and tie the bleeding vessel, and thus his life would, in all probability, have been saved. It seems to me passing strange, that the relation in which the employment of styptics and compression stands to the employment of the ligature for the arrest of secondary hæmorrhage, arterial in character, especially if it be profuse, should ever be overlooked by the surgeon. The reader must pardon me for stating in this place what I believe that relation to be, namely, the former should never be employed for the arrest of profuse secondary arterial hæmorrhage, unless the ligature has failed to control the bleeding, or, from some inherent reason, cannot be applied with safety to the patient. Styptics and pressure should be used for the arrest of that form of hæmorrhage, not from choice, but as remedies of expediency and of last resort. A single remark should be made with regard to the primary hæmorrhage which occurred in the foregoing case. Although it was rather profuse, for two or three minutes, it ceases spontaneously, because the vessel from which it came (the internal mammary artery) had been completely divided by the projectile, and thus was in a condition to permit occlusion of the bleeding orifice to spontaneously occur."

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[1] LIDELL, J. A., *On the Wounds of Blood-vessels, Traumatic Hæmorrhage, Traumatic Aneurism, Traumatic Gangrene.* Surg. Mem. of the War of the Rebellion, New York, 1870.

* There is probably an error in the military description in this case. The 45th Illinois regiment, attached to the Seventeenth Corps, was at Vicksburg at the date referred to, and no corresponding case appears on its hospital record. Lieutenant Jacob Elliott, Co. A, 42d Illinois Volunteers, was admitted on November 25th, 1863, at Chattanooga, with a gunshot wound of the chest, and died on December 8th, 1863, with symptoms similar to those described. The cases are probably identical. Surgeon Clendenin was Acting Medical Inspector of the Department of the Cumberland at the time, and appears to have taken notes industriously for his own use. The hospital records are very imperfect.—ED.

M. Tourdes has written an excellent monograph[1] on this subject. He shows from the cases he has collected that the lesion occurs with equal frequency on either side, that the prognosis is always extremely grave, that more than half of the cases are accompanied by section of the costal cartilages, and that this section always occurs when the vessel is wounded below the fourth rib, the last observation applying particularly to incised wounds. There may be external hæmorrhage and internally into the anterior mediastinum, into the pleural cavity and into the pericardium. The diagnosis may be very difficult, for the signs of intrathoracic extravasation are often equivocal. Nélaton[2] observes that if the hæmorrhage is suspended at the time of examination, anatomical considerations may afford presumptive evidence, and that every deep wound near the margin of the sternum from the first to the seventh rib should be viewed with suspicion. External arterial hæmorrhage decides the point; but this sign is often absent. The diagnosis may be complicated by bleeding from wounded lung, and the internal hæmorrhage then affords no decisive sign, the position of the wound alone suggesting the presumption that the internal mammary artery is interested. The vessel is often of sufficient calibre to furnish blood very freely, and death may result either from the profusion of the bleeding or from asphyxia from hæmothorax. Larrey advised to close the wound and leave the care of the bleeding to nature; but there are serious objections to this plan, which Larrey employed indiscriminately for all chest wounds with internal bleeding.[3]

For example, if the blood passes into the pericardium, the heart's movement is impeded, and soon arrested; if it enters the pleural cavity or mediastinum, there is room for hæmorrhage which must be mortal, and if the patient escapes these primary accidents he is exposed to those of putrid decomposition of the extravasated blood. Hence, we should prefer, with Velpeau, Marjolin, Gross, and Lidell, to tie the vessel, though this is an operation of extreme and sometimes almost insurmountable difficulty, a point which will be considered in the next Section.

Wounds of the Intercostal Arteries.—Gibson[4] remarks that "hæmorrhage from this source is neither so profuse nor so dangerous as has been commonly imagined," a sentence containing two erroneous propositions; for, as will be presently shown, a lacerated intercostal may pour four pounds of blood into the pleural cavity, and eleven out of fifteen cases reported during the war, or 73.4 per cent., had a fatal result. Didactic authors generally make light of this accident,[5] alluding justly to its extreme rarity, usually quoting Boyer's hackneyed witticism of the contrivances for arresting the bleeding being more numerous than the authenticated examples of the lesion, and often concluding by the suggestion of some ingenious method by the author. Baudens,[6] however, admits that wounds involving the intercostal arteries are interesting, and, agreeing with him that, though rare, they are important, I shall here enumerate the cases that were reported

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1 TOURDES, *Des blessures de l'artère mammaire interne sous la point de vue médico-légal*, Paris, 1849, p. 41.

2 NÉLATON, *Élémens de Path. Chir.*, T. III, p. 450.

3 "*Il est bien préférable*," he says, "*d'abandonner l'hémorrhagie produite par l'intercostale ou par la mammaire interne, aux seuls efforts de la nature; on ferme la plaie te sang s'accumule dans le thorax, et le poumon n'etant plus comprimé par l'air, se dilate de nouveau et annule le vide de la cavité.*" Clinique Chirurgicale, T. IV, p. 101.

4 GIBSON, W., *Institutes and Practice of Surgery*, 7th ed., Philadelphia, 1845, Vol. I, p. 112.

5 BOYER, *Traité dés mal. chir.*, 5me éd., T. V, p. 610; DUPUYTREN, *Leçons orales*, etc., T. VI, p. 355; VIDAL, *Traité de Path. Ext.*, 5me éd., T. IV, p. 96; NÉLATON, *Élémens de Path. chir.*, T. III, p. 452; ERICHSEN, *Science and Art of Surgery*, Vol. I, p. 438, observes that "the intercostal arteries usually seem to escape; or at least, if wounded, they do not bleed in a troublesome manner;" LEGOUEST (*Chirurgie d'Armée*, 2me éd. p. 347), regards most of the cases of wounds of the intercostal arteries cited by authors as *fort contestable*; but admits that the twenty-eight cases collected by MARTIN (*Des Lésions des artères intercostales*, Paris, 1855) leave little room for criticism.

6 BAUDENS, *Clinique des plaies d'armes à feu*, p. 213.

during the war* that were treated by compression, and cite, in the next Section, those in which ligation was performed, and will there refer to some of the ingenious modes of arresting the hæmorrhage that have occasioned so many sneers.

Case.—Private Oscar A. Barnes, Co. F, 20th New York Cavalry, was wounded, on March 5th, 1864, while sitting in his tent in camp at Northwest Landing, Virginia, by the accidental discharge of a Colt's revolver in the hand of a comrade. The ball entered between the third and fourth ribs, above and to the left of the left nipple, passed through the superior lobe of the left lung, making its exit near the inner border of the scapula, at the origin of its spine, fracturing the bone at this point and lodging under the integuments. Within thirty minutes after the accident the ball was extracted, together with several small pieces of bone, through an incision made through the integuments. Hæmoptysis and profuse hæmorrhage from the intercostal artery having set in, the wound was plugged with lint and cold-water dressings were applied. The patient was placed on the wounded side and perfect rest was enjoined. Opiates were freely administered. Expectorants were given to assist in relieving the lungs. As soon as suppuration appeared, the dressings were changed, and warm cataplasms were applied. The patient continued to expectorate bloody sputa for five days after the reception of the injury, after which he steadily improved. By the end of the month he had so far recovered as to be able to walk about. On July 31st, in the following year, he was mustered out of service. In April, 1867, the man was examined by Dr. George M. Cook, pension examining surgeon at Syracuse, New York, who reports him suffering from expectoration and frequent formation of abscess of the lung; also from lameness, resulting from a gunshot fracture of the metatarsal bone of the left foot, the disability being rated one-fourth for the latter wound and three-fourths for that of the lung. This pensioner was on the rolls in March, 1872. The case is reported by Assistant Surgeon M. W. Wilson, 118th New York Volunteers.

Case.—Private George Goodwin, Co. H, 100th New York Volunteers, aged 19 years, received a gunshot wound of the right lung during the attack on Fort Darling, May 16th, 1864. He was treated for a few days at the field hospital of the Tenth Army Corps, and subsequently at the Broad and Cherry Streets Hospital, Philadelphia. On June 23d, a hæmorrhage occurred from the intercostal artery. From six to ten ounces of blood were lost, when the hæmorrhage was checked by the application of persulphate of iron, aided by a compress. There was no recurrence afterward. On the following day, the patient had an attack of rubeola. He soon convalesced and improved steadily, and was soon able to leave for his home on furlough. On August 26th, 1864, he was returned to his command entirely recovered. He is not a pensioner. Surgeon John Neill, U. S. V., reports the case.

In the two following fatal cases of hæmorrhage from the intercostal arteries, the patients were apparently exhausted by bleeding prior to their admission to hospital:

Case.—Private Anson A. Barrett, Co. E, 12th U. S. Infantry, was wounded at the battle of Cedar Mountain, August 9th, 1862, by a musket ball, which entered three inches to the left of the sternum, at the inferior margin of the first rib, and emerged near the sixth dorsal vertebra, severing in its course an intercostal and one of the larger bronchial arteries. He was conveyed by rail to the Third Division Hospital, at Alexandria, where he died from the effects of hæmorrhage, on August 17th, 1862.

Case.—Private Charles Hale, Co. F, 22d Massachusetts Volunteers, was wounded at the battle of Rappahannock Station, November 7th, 1863, by a fragment of a shell, which produced a severe fracture of the right side of the chest and rupture of an intercostal artery. Two days after the reception of the injury, the wounded man reached the Finley Hospital, where the bleeding was imperfectly controlled by compresses and styptics. The patient died on the following day from the effects of hæmorrhage. Surgeon B. B. Breed, U. S. V., reports the case.

In the next three cases the arterial lesions were verified at the autopsies. Two were complicated by hæmothorax:

Case.—Private Edward Fanning, Co. M, 1st Missouri Cavalry, was accidentally shot through the thorax at Cape Girardeau, Missouri, on December 19th, 1863. He was conveyed to the post hospital, where he lingered until December 30th, 1863. The *post mortem* examination disclosed that the missile, a conoidal pistol ball, had entered above the right nipple, passed through the sternum and upward, splintering the third rib, left side, and wounding the intercostal artery, thence going into the left shoulder, fracturing the head of the humerus and lodging in the glenoid cavity. The thoracic cavity was found to contain two quarts of yellowish blood. The lungs were congested and the left pleura was inflamed and softened. Reported by Acting Assistant Surgeon Patrick Gilroy.

Case.—Private Josiah Kreider, Co. E, 45th Pennsylvania Volunteers, received, at Campbell Station, East Tennessee, November 16th, 1863, a penetrating wound of the thorax by a conoidal ball. On the same day, he was admitted to Asylum Hospital, Knoxville, where he died on December 1st, 1863. *Post mortem* showed that the ball entered between the third and fourth ribs, three inches from the median line, fracturing fourth and fifth ribs, right side, wounding intercostal artery, and emerged between seventh and eighth ribs, five inches below axilla, same side; there was extensive inflammation of upper and middle lobe of right lung; lower lobe collapsed; cavity between pleura pulmonalis and pleura costalis filled with blood from a secondary hæmorrhage, which had been both internal and external. The case is reported by Surgeon C. W. McMillen, 1st Tennessee Mounted Infantry, by whom the autopsy was made.

* In the tenth edition of his favorite *Vade Mecum* (p. 484), Dr. Druitt, after adverting to Mr. Lawson's statement that "the intercostal artery was not once secured in the Crimean campaign," cites *Circular No.* 6, S. G. O., 1865, as authority for the assertion: "the same was the case in the American wars." On page 71 of that report two cases of ligation of the intercostal are referred to.

CASE.—Lieutenant John S. Robinson, Adjutant 7th Illinois Volunteers, was wounded at the battle of Allatoona Pass, Georgia, October 5th, 1864, by a conoidal musket ball, which entered near the inferior angle of the left scapula and emerged anteriorly, fracturing the sixth rib, penetrating the left lung, and tearing an intercostal artery. Copious bleeding from the anterior opening, together with expectoration of blood, followed the injury. The hæmorrhage was checked by the application of persulphate of iron. After this, tincture of veratrum viride was administered for about two weeks. The patient remained at the field hospital of the 4th division, Fifteenth Corps, for over four weeks, being greatly debilitated and in bad health at first, but mending sufficiently to bear transportation to a general hospital on November 3d. On the following day, he reached Hospital No. 1 at Chattanooga, Tennessee, where he died on January 4th, 1865. Surgeon T. R. Zearing, 57th Illinois Volunteers, reports the wound, and Surgeon J. H. Phillips, U. S. V., the termination of the case.

In the seven foregoing instances, hæmorrhage was primary in four, intermediary in one, and secondary in one, and resulted from wounds by musket balls in four cases, from pistol balls in two, and from a shell fragment in one. The injuries were inflicted on the right side in four and on the left in three cases, and were associated in four cases at least by perforation of the lung. Nearly all of the wounds were in the space bounded by the third to the sixth ribs, inclusively. Compresses and styptics were the only local measures employed. This subject will be continued in the next Section. Bleeding from laceration of the pulmonary tissue will be considered in connection with hæmothorax, empyema, etc , in the observation at the close of the Chapter.*

Specimen 1640, of the Army Medical Museum, is an example of the rare lesion of a rupture of the left subclavian *vein*.†

CASE.—Valentine K———, commissary detachment, was caught between the buffers of two railway cars, July 20th. The humerus, clavicle, and scapula were fractured, the neighboring soft parts were pulpified, though the skin was unbroken. The left arm became sphacelous, and the patient died July 23d, 1863. The subclavian artery was obliterated, where it leaves the first rib. The subclavian vein was torn and had supplied the blood which distended the soft parts. Assistant Surgeon W. Thomson, U. S. A., presented the specimen and memorandum.

Specimen 2721, shows a bayonet wound of the right subclavian, near the innominata, opening two-thirds of the cylinder of the artery. It is from a soldier killed at Fort Wagner.

Aneurism.—False diffused and consecutive aneurisms were among the secondary conditions rarely observed after gunshot wounds of the thorax.‡ The following is an example, and a few others will be cited in the next Section.

CASE.—Private *J. H. Carpenter*, Co. C, 4th Virginia Cavalry, aged 28 years, was wounded on May 12th, 1864, by a minié ball, which entered one and a half inches below the inner third of right clavicle, making exit one inch from and parallel to posterior border of right axilla. On May 15th, he was admitted to Chimborazo Hospital, Richmond, Virginia. The patient spat blood at the reception of the wound and for several days afterwards; and on May 20th, hæmorrhage occurred from a branch of

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*Consult HARDER, *Diss. de hæmorrhagia arteriæ intercostalis sistenda*, Berolini, 1823; ASSALINI, *Manuale di Chirurgia*, Milano, 1812, p. 57; RAVATON, *Pratique moderne de la chirurgie*, Paris, 1785, Vol. II, p. 130; CHELIUS, *Über die Verletzung der Art. intercostalis* in Heidelberger klinische Annalen, B. I, T. IV; GANT, *Science and Practice of Surgery*, p. 884; VELPEAU, *Nouv. Élé. de Méd. Op.*, T. II, p. 265; HARRISON, *Surgical Anatomy of the Arteries*, 4th ed., Dublin, 1839; FRASER, P. A., *Treatise on Penetrating Wounds of the Chest*, London, 1859, p. 111; SANSON, *Des hémorrhagies traumatiques*, Paris, 1836, p. 252.

† No example of *gunshot* wound of the subclavian vein is reported as having come under treatment, unless the case mentioned on page 522 be regarded as such. The case reported by Mr. Blenkins (FRASER, *op. cit.*, p. 13), where a ball passed between the right subclavian artery and vein, wounding the latter, and causing fatal phlebitis, remains the solitary recorded instance. But, as Mr. Fraser observes, the exemption is ideal rather than real, for probably a large proportion of those killed on the field of battle die from torn blood-vessels.

‡ Traumatic affections of the great blood-vessels of the chest are usually passed over cursorily by systematic authors, and our information concerning these is scattered through theses, monographs, journals, and collections of cases. LEGOUEST (*op. cit.*, p. 333) quotes a unique instance of recovery from a punctured wound of the aorta, observed by Dr. Neil of Bamberg, in 1812 (HENKE'S *Zeitschrift für Arzn.*, Heft II, 1837, 1839, and *Arch. gén. de méd.*, 2me série, 1838, T. II, p. 109), the cicatrix being verified a year subsequently at the autopsy after death from pneumonia. DEMME (*op. cit.*, p. 37) saw a young Austrian at the hospital of St. Francis, at Milan, perish from secondary hæmorrhage four weeks after the reception of a gunshot injury of the pectoral portion of the descending aorta. BLANDIN (*Anatomie topographique*, 2d éd., 1834, p. 287) observed at the Beaujon hospital a young man who survived a short time a pistol wound of the azygos vein, near its terminal curve. BRESCHET (*Repertoire général d'anatomie et de physiologie pathologique et de clinique*, T. IV, p. 196) records an autopsy of a youth of twenty-five years, who received in a duel a punctured wound of the azygos vein in the curve it describes before emptying into the cava near the right side of the body of the fifth dorsal vertebra; the patient survived three days. TIMEUS, of Colberg (*Responsis medicis et diactetieis*, 1668, C. XVI, quoted by Bonetus, *Sepulchretum*, Vol. III, p. 359) records the case of a nobleman, stabbed through the right axilla, between the third and fourth ribs, the blade wounding the pulmonary artery. Frothy blood flowed externally and there were frequent syncopes; but the wounded man lived three days. *Specimen* 3388, of the Surgical Section of the Army Medical Museum, affords a rare instance of compression of the left upper pulmonary vein by a conoidal ball imbedded in the adjacent bony substance. The patient died on the twelfth day from secondary hæmorrhage. See HENNEN (*l. c.* 3d ed. p. 57) for a case of rupture of the azygos.

the axillary artery, but was controlled by a solution of persulphate of iron. He improved until June 6th, when considerable fever supervened, with great pain in the right side and cough; no expectoration; ten grains of calomel and two grains of opium were administered at once; the next day he was much improved, with no pain and less fever; anodynes were given nightly, and he continued to improve until the 18th when the wound had healed. It was then discovered that traumatic aneurism of the axillary artery had formed; the pulsating tremor was distinctly felt and easily recognized. The patient remained in hospital until a satisfactory diagnosis could be made. He was furloughed on June 27th, 1864. The case is reported by Dr. Dickie, P. A. C. S., in a case-book of the Chimborazo Hospital.

Wounds of the Pericardium and Heart.—Some of the cases reported are interesting in a medico-legal point of view, others as illustrating the difficulties of diagnosis in this class of injuries, and others again as objects of curiosity or extreme instances of what nature can bear.

Wounds of the Pericardium.—A number of examples of gunshot wounds of the pericardium were recorded, in which the patients survived several weeks, and the symptoms were noted with more or less exactitude, and the nature of the lesions were verified by *post-mortem* examination. Cases of recovery are also noted, in which, if the evidence of this injury is not irrefragable, the reporters appear to have formed the diagnosis with tolerable precision. Some observations of secondary pericardial disease excited by gunshot injury have already been cited (pp. 488, 492) and others will be adduced. The cases tend to confirm the conclusion of Fischer,[1]—derived from an analysis of fifty-one cases, with twenty-two recoveries,—that wounds of this membrane, unless gravely complicated, are less dangerous than has been generally supposed:

Case.—Private Henry C. Vaughn, Co. K, 3d Iowa Cavalry, aged 28 years, was wounded, during General Pleasonton's campaign in Missouri, October 23d, 1864, by a conoidal ball, which entered the ninth rib, just under the left nipple, and emerged about eight or nine inches posterior to the point of entrance, wounding the pericardium in its course. The rib was very much splintered at the point of entrance. He was taken to the post hospital at Independence, Missouri, where simple dressings were applied. On October 25th, he was transferred to the hospital at Kansas City, Missouri. Extensive pleuritis and the decomposed fluids made the case a very severe one, but the patient bore his extreme sufferings with great fortitude. Death resulted on November 5th, 1864. The case is reported by George H. Hood, Acting Assistant Surgeon.

Case.—Private James Ackerman, Co. I, 81st Pennsylvania Volunteers, aged 18 years, was wounded at Gaines's Mills, Virginia, June 27th, 1862, and admitted to Hygeia Hospital, Old Point Comfort, June 30th, with gunshot comminuted fracture of both bones of the forearm near the elbow-joint; the ball, a minié, having passed through, and then entering the chest, between the fifth and sixth ribs, at the junction of the cartilage with rib. The ball could not be found, although search was made with a female catheter. The track of the wound was very obliquely through the intercostal muscles toward the apex of the heart. There was dulness of the anterior part of the left chest, and he suffered some pain and dyspnœa. There was no cough nor expectoration. The patient seemed well and comfortable during the day, but at night was always delirious, frequently screaming out that "the rebels were after him." The arm was placed in an angular tin splint, and dressed with cold water until the inflammation subsided and suppuration became free. He died July 12th, 1862, At the necropsy, the ball was found to have passed along the diaphragm from the place of entrance and entered the pericardium at its apex, and was found lying loosely in that sac, together with considerable serum and flakes of lymph. The surface of the heart was also covered with lymph, but its coverings were not wounded. The track of the wound had healed, as well as the wound in the pericardium; in fact, it was difficult to detect the spot which marked its entrance. The lungs and liver were healthy. The arm did not exhibit any evidences of repair. The case is reported by Surgeon R. B. Bontecou, U. S. V.

Case.—Private Ambrose Burgess, Co. E, 16th Maine Volunteers, was wounded at Fredericksburg, Virginia, December 13th, 1862, by a conoidal musket ball, which fractured the fourth rib and penetrated the lung; the missile entered the left side about the angle of the seventh rib, taking an upward direction, and emerging at the nipple, between the third and fourth ribs. He was received into the First Corps hospital, and, on December 23d, admitted to Harewood Hospital, Washington. When received he was exceedingly weak; the wound was dressed, and brandy and milk punch freely administered; he continued, however, to sink, and died December 26th, 1862. Necropsy showed that the ball in its course had opened the pericardium and penetrated the lower lobe of the lung. The case is reported by Surgeon Thomas Antisell, U. S. V.

In the next case it is to be regretted that the opportunity of making an autopsy was neglected:

Case.—Private John A. Clark, Co. I, 3d Maine Volunteers, was admitted to Judiciary Square Hospital, Washington. July 10th, 1863, with a gunshot wound of left lung, received at Chancellorsville, Virginia, May 2d, 1863. He was discharged the service on February 12th, 1864. There was confirmed tuberculosis; predisposition existing before enlistment; the exciting cause, probably, being the wound; also slightly impaired use of arm. The case is reported by Assistant Surgeon Alexander

[1] Fischer, G., *Die Wunden des Herzens und des Herzbeutels*, in Archiv für Klinische Chirurgie, B. IX. p. 571.

Ingram, U. S. A. Pension Examiner James B. Bell, Augusta, Maine, reports March 22d, 1864: "Ball entered one inch above the left nipple slightly to the inside, passed directly through the chest at right angles with the walls; probably wounded the pericardium, and passed within half an inch of the heart. The disability now results from hæmoptysis, debility and pain, and may be permanent." December 18th, 1866, he reports: "Died from hæmorrhage of the lungs from the seat of the wound on June 6th, 1866."

In the first of the three succeeding cases of recovery, the diagnosis of wound of the pericardium is more positively made than in the other two:

CASE.—Private Anthony H. Rabell, Co. I, 83d Pennsylvania Volunteers, aged 27 years, was wounded at Spottsylvania, Virginia, May 8th, 1864, by a conoidal ball, which entered left chest four inches below axilla, fractured fourth and fifth ribs, passed through the pericardium, and was removed from middle portion of sternum. He was taken to Fifth Corps hospital, and, on May 14th, admitted to Harewood Hospital, Washington. Supporting treatment, with rest and quiet, was adopted. He was furloughed on July 12th, and returned to hospital September 18th; was again furloughed October 30th, and readmitted November 25th, 1864. February 4th, 1865, the wound had entirely healed; he complained of a difficulty in lying down, and required his shoulders to be raised in order to obtain rest; this was probably caused by adhesions that had taken place. He was discharged the service June 6th, 1865. The case is reported by Surgeon R. B. Bontecou, U. S. V. Pension Examiner George S. Gale, New York City, reports, January 1st, 1869, that the ball entered three inches below and back of left nipple, passed up and forward to sternum, injuring the bone, and causing pleuritis and consequent adhesions; there was shortness of breathing on severe exercise; the muscular adhesions along the track of the ball, particularly, cripple the action of left arm by rendering the pectoral muscles nearly powerless.

CASE.—Captain William McConihe, Co. F, 2d New York Volunteers, was wounded at Chancellorsville, Virginia, May 2d, 1863, by a conoidal ball, which entered the left chest between the fifth and sixth ribs near the sternum, and lodged. He was conveyed to the field hospital of the 1st division, Second Corps, where simple dressings were applied to the wound. He was subsequently treated in private quarters in Washington; was furloughed on the 11th, and discharged from service May 26th, 1863. Pension Examiner W. W. Potter reports, August 7th, 1866: "The pulse is irregular, frequent, and feeble. The peculiar action of the heart and the condition of the circulation lead to the belief that the structure of the pericardium, or the heart itself, was injured by the ball. Disability total and permanent."

CASE.—Private Calvin F. Jones, Co. H, 36th Illinois Volunteers, was admitted to Hospital No. 1, Murfreesboro', Tennessee, January 8th, 1863, with a gunshot penetrating wound of the chest, received at Murfreesboro', December 31st, 1862. He was returned to duty February 19th, 1863, and discharged from service April 9th, 1863. Surgeon F. W. Lytle, 36th Illinois Volunteers, who reports the case, states, on the certificate of disability, that Jones was wounded through the left side of the chest, involving the tissue of the left lung, and probably of the heart or its coverings, giving rise to palpitation whenever he takes any exercise.

CASE.—Private William L———, Co. B, 6th Ohio Cavalry, aged 18 years, was wounded in a skirmish on the Rapidan River, Virginia, September 8th, 1863; one ball entered the left side of the thorax on a level with the fourth rib, posterior to the junction of the cartilage with the bone, and emerged eight and one-half inches posterior to the wound of entrance, and three ribs lower down, fracturing the seventh rib anterior to its angle. The second ball entered on a level with the tenth rib, passed from behind forward, and fractured the ninth rib about one inch posterior to the junction of the cartilage with the bone. He was conveyed to Washington, and admitted, on the 12th, to Lincoln Hospital. On admission, he was very pale and anæmic and suffered greatly from his wounds; no emphysema of surrounding integument. Respiration 40 per minute, short and labored. Cough harassing, though no sputa was brought up. No difference in measurement existed between the two sides of the chest; pulse, 108; sleeps poorly; orthopnœa prominent. September 17th: It was observed that, in addition to the empyema which was present on the left side, a violent pleurisy had attacked the right. The combined sources of depression rapidly exhausted the remaining vital power of the patient. On the 20th, several spiculæ of bone were removed from the wound of exit. The coughing would occasionally cause large quantities of purulent matter to be discharged from the wound. The person and surroundings of the patient became offensive in the extreme, rendering him a pitiable object. On the 25th, pericarditis was detected. At this time, he presented the following symptoms: orthopnœa; sits up in bed with head-frame behind him; respiration 45 per minute and laborious; face expressive of great exhaustion, pallid; nostrils dilated strongly at every inspiration; wild expression of eyes, pupils contracted. Pulse variable, generally rapid, compressible, and soft. No fever or delirium. Death resulted on October 6th, 1863. Necropsy: Right lung displaced; almost the entire space of anterior part of the thorax occupied by distended pericardium; left lobe of liver united to omentum by a recent exudation of lymph; thirty ounces of fluid in right pleural cavity, twenty ounces of pus in left. Right lung covered from apex to base with a layer of yellowish lymph, and in many places erected into trabeculæ uniting lung to pleura costalis; lobes agglutinated together and to the diaphragm; posterior portion of lung engorged with blood; left lung semi-solidified and filled with minute abscesses. Upper part of pleura covered with layer of lymph, lower part thickened and discolored by pus. Abscess in first lobe completely circumscribing second lobe; the pericardium contains thirty ounces of a clear colored mahogany serum and, together with the heart, was covered with a thick layer of yellowish lymph. The liver was somewhat softened. Acini somewhat indistinct. *Spec.* No. 1722, Sect. I, A. M. M., shows a wet preparation of the sixth, seventh, and eighth ribs. The specimen shows firm pleuritic adhesions. Specimen No. 2243 of the same section shows a wet preparation of the heart and pericardium. Both of the serous surfaces are shaggy with profuse deposits of lymph, which, in the recent state were pinkish in color. Toward the posterior surface the two sides of the pericardium are united. Both specimens were contributed, with a history of the case, by Assistant Surgeon H. Allen, U. S. A.

Wounds of the Heart.—It is well known that wounds of the heart are no longer considered, as in ancient times,* absolutely and invariably mortal; but we are still ignorant of the degree of injury the organ may sustain without destruction of life, and can only conjecture the causes of delay in the termination of some rare cases presenting lesions that are generally instantly fatal. The diagnosis is very obscure. Hæmorrhage, syncope, pain, dyspnœa, præcordial anxiety, pallor, husky voice, thready pulse, excessive thirst, emesis, hiccough, cold sweats, palpitation, a systolic bellows murmur or other abnormal sounds, many or all of these may attend a wound in the cardiac region without establishing more than a presumption that the heart itself is wounded. A peculiar friction sound has been suggested as pathognomonic of traumatic pericarditis; but few surgeons can have occasion to familiarize the ear with this semeiological refinement. In the cases that survive for any length of time, the prognosis will, of course, be very guarded, and the treatment, after closing the wound, will be limited to absolute bodily rest, and the employment of those measures tending to moderate the heart's action, unless the dyspnœa induced by distention of the pericardial sac should justify the withdrawal of the extravasation by paracentesis.† A perusal of the conflicting views of writers respecting the relative danger of injuries of the different cavities of the heart, and even in regard to the gravity of superficial wounds, and their frequently indefinite descriptions of the remote structural changes observed, admonish us that further careful clinical and pathological observations are requisite to elucidate these points. Though many of the cases that appear on the surgical records of the war are not of this character, yet no apology need be made for presenting all the facts that have been ascertained on this difficult and interesting subject. Four instances of gunshot wounds of the heart that were not immediately fatal appear on the records. In the first, the patient survived for fourteen days a wound of the right auricle by a round musket ball:

CASE.—Private Jacob Lanning, Co. A, 51st Pennsylvania Volunteers, aged 45 years, was wounded at South Mills, North Carolina, April 18th, 1862; the missile entered through the lower jaw, carried away the symphysis, passed down the left side of the neck, and lodged in the thorax. He was taken prisoner and remained in the enemy's hands until the 24th, when he was released at Norfolk and conveyed to Hygeia Hospital, Old Point Comfort. The tongue was destroyed to a considerable extent, and that portion of the jaw occupied by the incisors was comminuted and distributed along the course of the ball. An incision was made in the lower part of the neck to give exit to the pus, and through this opening the finger could be passed down into the chest. The case appearing hopeless from the first, little was done except to sustain and stimulate. The patient persisted in sitting up and would occasionally attempt to make up his bed and walk about the room when not restrained. He died suddenly, May 2d, 1862, fourteen days after the reception of the injury. At the necropsy, the ball was found to have descended over the aorta, down the mediastinum, penetrated the muscular tissue of the right auricle, and was suspended in the endocardial cavity. Evidence of pleuritis and pericarditis were apparent after, though not before, death. The case is reported by Surgeon R. B. Bontecou, U. S. V.

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*HIPPOCRATES: Aphorism XVIII, Sect. 6; CELSUS (Lib. V, cap. 26): "*Servari non potest cui cor percussum est,*" and, farther on: "*Corde percusso, matura mors sequitur.*" Galen's prognosis is hardly less gloomy (*De locis affect.*, Lib. V, cap. 2): "*Protinus hominem mori necesse est,*" and "*Igitur, si ad ventrem cordis vulnus aliquando penetraverit, protinus magno cum sanguinis fluore moriuntur, id que precipue, si sinistræ partis venter fuerit vulneratus.*"

†Several authors have made collections of cases of wounds of the heart. The latest and most complete perhaps is by Dr. GEORG FISCHER, of Hannover, who, in an article in von Langenbeck's *Archiv für Klinische Chirurgie*, B. IX, H. II, S. 571, Berlin, 1868, enumerates four hundred and fifty-two cases, of which forty-four, with ten recoveries, were punctured wounds; two hundred and sixty, with forty-three recoveries, were punctured-incised wounds; seventy-two, with twelve recoveries, were gunshot wounds; seventy-six, with ten recoveries, were contusions and traumatic ruptures. M. JAMAIN (*Plaies du cœur*, Thèse de concours pour l'agrégation, Paris, 1857, 8vo. p. 100) has analyzed one hundred and twenty-one cases. Dr. PURPLE (*New York Journal of Medicine*, 1855, N. S. Vol. XIV, No. III, p. 411), with his *Statistical Observations of Wounds of the Heart*, has compiled a table of forty-two authenticated cases of wounds of the heart that were not immediately fatal, twelve being injuries from gunshot. OLLIVIER (d'Angers) records (*Dict. de Méd.*, 1834, T. VIII) fifty-four cases of wounds of the heart, and SANSON (*Plaies du cœur*, Thèse, 1827, p. 16) enumerates the more important cases cited by his predecessors. DUPUYTREN (*Leçons orales*, 2me éd.) refers to fourteen cases, four of which came under his own observation. FOURNIER gives several examples in his *Cas Rares* (*Dict. de Sci. Méd.*, T. IV). CHASTANET (*Journal de Médecine Militaire*, Paris, 1783, T. II, p. 577) has collected many cases from Bonetus, Morgagni, and others, and recorded five highly interesting observations of his own. I have grouped together (OTIS, *A Report of Surgical Cases*, etc., 1871, p. 33) twenty-one cases of wounds of the heart observed in the Army of the United States from 1865 to 1870, eighteen being gunshot, two incised, and one a punctured wound from an arrow.

The next case refers to a patient who lived an hour and a quarter after a perforation of the right auricle and left ventricle by a conical pistol ball:

CASE.—Private Charles T———, 1st Maryland Potomac Home Brigade, aged 25 years, received a pistol-shot wound of the left side in an affray with the provost guard at Frederick, Maryland, February 14th, 1862, at about 11 P. M. The person discharging the pistol was standing within a few feet of Thompson, who had his left side turned toward him. The bullet entered just over the fourth rib, on a line with the anterior fold of the axilla. The patient immediately became much prostrated and speedily unconscious, with much jactitation and labored respiration, but no hæmoptysis or emphysema was observed. He was first seen about 11.30 P. M. On auscultation and percussion the action of the heart was weak and tumultuous, and the left side of the chest exhibited marked dulness, indicating effusion of blood into the pleural cavity. He died at 12.15 A. M. The necropsy, twelve hours afterward, revealed a fracture of the fourth rib, a wound of the lower and anterior portion of the upper lobe of the left lung, which track was found continuous with one passing through the left ventricle of the heart about its centre, and emerging at the right auricle; thence it passed through the outer and upper portion of the middle lobe of the right lung, and terminated by a small puncture of the pleura costalis over the fifth rib. The bullet was found in the right pleural cavity, which, like the left, contained about fourteen ounces of effused blood. The pericardium also contained about four ounces of blood. Surrounding the track of the wound in the pulmonary tissue, was a mass of coagulum, which explained the absence of hæmoptysis and emphysema. The bullet was the ordinary conical one used in revolving pistols. A wet preparation of the heart is *Spec.* No. 837, Sect. I, A. M. M., and was contributed, with a history of the case, by Assistant Surgeon R. F. Weir, U. S. A. Circular No. 6, 1865, states erroneously that the patient "survived twelve hours." He died near *twelve*, midnight.

The third is an example of perforation of the left auricle and left ventricle by a pistol ball. The patient lived forty-six hours after the reception of the injury, although the case was complicated by wounds of the abdomen and axilla:

CASE.—Private Lewis Wright, Co. C, 4th Regiment, Veteran Reserve Corps, aged 28 years, was wounded at Quincy, Illinois, September 8th, 1864; he was assaulted by an intoxicated citizen, who fired several shots at him, three of which took effect; one, an inch above the crest of the ilium, in the middle line of the left side; another through the anterior boundary of the axillary space, and the third on the right side of the back, about two inches exterior to the inferior angle of the scapula. The patient when brought to the hospital was cold and almost pulseless, though conscious. He complained of a general sense of indescribable suffering and unquenchable thirst; very little hæmorrhage had taken place. The situation of the balls could not be ascertained. Anodynes, diffusible stimulants, friction, and artificial heat were resorted to, but any means to bring on reaction proved unavailing. The patient lived just forty-six hours after the reception of the wounds. At the *post mortem* examination of the body it was found that the first ball had entered above the crest of the ilium, passed directly into the cavity of the abdomen and into the intestines. The second simply passed through the anterior boundary of the axilla from below upward. The third entered the chest at the point specified, fractured the posterior third of the eighth rib, entered the right lung about its middle, passed through it and into the left auricle of the heart, thence through the auriculo-ventricular opening to the left ventricle, making its exit about the middle of the lateral aspect of the organ, thence through the pericardium, and could be traced no farther. The balls entering the body were small, which made the track difficult to trace through the different tissues, so much so that with the utmost care and perseverence no ball was found. A pint or a pint and a half of blood was found in the right chest. Acting Assistant Surgeon J. T. Wilson reports the case.

In the fourth case, the testimony of the existence of a cicatrix of a musket-ball wound of the right auricle, and of softening and rupture of the muscular tissue, two and a half years after recovery from the injury, is very positive:

CASE.—Private John Reynolds, Co. D, 1st Michigan Sharp-shooters, aged 42 years, received a gunshot wound of the left breast and shoulder at Spottsylvania, Virginia, May 12th, 1864. He was conveyed to the field hospital, where simple dressings were applied to the wound. On May 25th, he was transferred to the 1st division hospital, Alexandria; on February 25th, 1865, to Fairfax Seminary Hospital, Virginia; on April 4th, to St. Mary's Hospital, Detroit, Michigan, and on May 26th to Harper Hospital, Detroit, whence he was discharged from service July 14th, 1865. He died at Mattawan, Van Buren County, Michigan, November 22d, 1866. A *post mortem* examination was made by Drs. David Brown and Nathan M. Smith. The ball entered the body between the fourth and fifth ribs on the left side, passed upward and backward and emerged between the clavicle and scapula of the same side, wounding in its passage the anterior surface of the auricle of the heart, producing the appearance of a cicatrix on said auricle, organic lesion resulting therefrom, and subsequently decay and rupture of the auricle, causing almost instantaneous death. All the vital organs except the heart were healthy.

Without the slightest disposition to impugn the accuracy of the conclusions of Dr. Brown and Dr. Smith regarding the morbid conditions observed at the necropsy, I may be permitted to ask if the paucity of details concerning the wound does not warrant a certain skepticism as to the relation sought to be established between it and the appearances noted at the autopsy. It is known that the milk spots (*maculæ albidæ*) of Rokitanski have been mistaken for cicatrices.

That death is apparently absolutely instantaneous after some wounds of the heart is generally conceded, yet the absence of all automatic muscular movements is uncommon. Diemerbroeck describes (*Anat. Corp. hum.*, Lib. VI, c. I) a man receiving a sword thrust in the chest, and falling dead instantly: *Quasi fulmine ictus concidit moxque extinctus est*, and in many cases of military executions death is pronounced to be instantaneous; but the extinction of vitality, resulting from the sudden gush of blood, rarely resembles that caused by the lightning stroke, the sideration of chloroform, woorara, or prussic acid, or by a wound of the medulla oblongata. Mr. Poland correctly observes (*loc. cit.*, p. 608) that "the popular notion of persons springing up in the air, when shot through the heart, is not verified by facts." There is a hurried exclamation or a convulsive gasping not infrequently, and the phenomena usually attendant on sudden syncope or collapse, are, according to Herr Fischer's statistics, those that commonly predominate. The two following abstracts, the first by a distinguished writer on military surgery, the second a tragi-comic account of the homicide of an officer fleeing from his friends, graphically depict sudden deaths from heart wounds:*

CASE.—Private Edward Barrett, Co. F, 32d New York Volunteers, was shot by a sentinel at Camp Newton, Virginia, January 30th, 1862. Medical Inspector Frank H. Hamilton, U. S. A., in a report of the case in the *American Medical Times*, Vol. VIII, p. 193, says: "Assisted by Surgeons Little, Brown, Totten, and others, I made an autopsy on the same day. The ball had entered on the left side of his chest about four inches below the inferior angle of the scapula, striking and breaking the lower margin of the eighth rib and carrying some small fragments into the track of the wound. The wound of entrance was rather smaller than an ordinary musket ball, oval, its edges slightly inverted and surrounded with a reddened areola, caused by the integument being slightly abaded or deprived of its cuticle by the pressure of the ball before it penetrated the tissues. From this point the track of the ball passed through the free margin of the upper lobe of the left lung, making a contused, but not lacerated, cylindrical channel, which channel was surrounded through its whole length by an ecchymosis of about one inch in diameter. The ball then penetrated both ventricles and the right auricle, and through the upper lobe of the right lung, escaping in the right axilla. The track through the right lung presented the same appearance as that through the left; and the wound of exit was larger by one-half than the wound of entrance, somewhat oval also, the edges not everted, but looking discolored, as if they were blackened by powder. This discoloration was found to be due to a slight extravasation of blood into the tissues under the skin. The heart was firmly contracted and contained no blood in any of its cavities; but the pericardium contained about eight ounces, and the two pleural cavities much more. The lungs were completely collapsed. The wounds in the several cavities of the heart were not in any instances more than three lines in diameter, and appeared like slits, as if made by a pointed instrument. After this man was shot, he uttered one exclamation and fell apparently dead."

CASE.—"Lieutenant Dennis H. J———, Co. I, 55th Massachusetts Volunteers, was accidentally shot through the heart by a fellow-officer at Yellow Bluff, Florida, March 23d, 1864, while they were attempting to escape from an apprehended attack by the rebels. In the hand of the latter officer was a Smith and Wesson revolver cocked, which was discharged as they both slipped and fell together at the edge of the water into which they were trying to drag their boat. Jones instantly fell back into the water, only exclaiming twice "save me! save me!" evidently under the impression that the shot came from the enemy; his face also expressing rather terror at the report than bodily pain from the wound. For an instant he convulsively grasped the rope, but soon let go, and with one gurgling respiration both heart and lungs appeared to have ceased to act within half a minute. The supposed rebels proving to be a party of engineer soldiers from this post, the non-recognition having been mutual, the body was recovered and brought to the post hospital; no further sign of life was manifested, except a sort of groan when the body was raised, about five minutes after the accident, which may well be supposed to have been the result of the sudden displacement of the large quantity of fluid in the cavities rather than of any conscious voluntary action. The accident occurred at five o'cloek P. M. Necropsy: *Rigor mortis* slight. Surface of body very pale and rather cool. The single external wound was very small and situated two inches below and a little inward from the left nipple. There had been no external hæmorrhage, but on opening the chest more than three quarts of blood were found in this cavity and that of the pericardium, the lung being compressed against the anterior parietes. From its entrance between the fifth and sixth ribs, the ball had passed almost directly backward, inclining obliquely toward the middle line, perforating the pericardium and the heart near its apex, so as to leave two openings in the pericardium and left ventricle, and had buried itself, base foremost, in the body of the eleventh dorsal vertebra, but without entering the spinal canal. The wound of entrance of the heart was one inch above the apex of the organ and close to the interventricular septum; that of exit was one inch and three-quarters above the apex and three-quarters of an inch from the septum. The former was small and one-fourth of an inch in diameter throughout; the latter was one-fourth of an inch in

*For descriptions of sudden deaths from wounds of the heart, consult HELWIG (*Observationes medico-physicæ*, 4to, Augsburg, 1860, Obs. 68); PRIOU (*Mémoires sur les plaies pénétrantes de la poitrine*, in Mém. de l'Acad. roy. de Méd., Paris, 1833, T. II, p. 426)—an armorer falls dead without uttering a word, the heart traversed lengthwise by two pistol balls; TIMÆUS (*Casus med. prax.*, Leipzig, 1677, Lib. VI, Obs. 38), *subitoque concidens, illico mortuus est*; OLLIVIER (*l. c.*, p. 249), three cases of stabs of left ventricle; heart contracted and empty. It is probable that the rapidity of death is due not to the profuse bleeding, as SENAC (*Traité de la structure du cœur*, Paris, 1749, T. II, p. 371) supposed, but to the obstacle to the circulation caused by distension of the pericardium as MORGAGNI (*l. c.*, ep. 67) explains.

diameter at its inner extremity, but greatly increased in calibre from within outward so as to be of a conical shape, with edges somewhat torn. The columnæ carneæ on the septum were barely grazed in one spot, whence it may be inferred that the ventricle was dilated when struck by the ball. The contrast between the two wounds suggests the idea that the inversion of the ball may have been caused by the contraction of the posterior wall of the ventricle at the moment of perforation. Both the ventricles were empty." *Spec.* 2639, Sect. I, A. M. M., is a wet preparation of the lower part of the heart; the missile is attached. It was contributed, with a history of the case, by Assistant Surgeon Burt G. Wilder, 55th Massachusetts Volunteers.

Cardiac Diseases resulting from Wounds.—A number of cases are found on the hospital records of functional or organic diseases of the heart confidently referred to the remote effects of gunshot injuries of its envelope or the tissues in the immediate vicinity. Some of these cases are carelessly alluded to by clerks or pension examiners as recoveries after wounds of the heart. The following are examples of this group of cases:

CASE.—Sergeant Herrick Hodges, Co. I, 17th Michigan Volunteers, was wounded at Antietam, Maryland, September 17th, 1862; the ball entered the left chest, passed through the seventh rib, and lodged in the lung; he also received a wound through the calf of the left leg. He was treated in the field until October 3d, when he was transferred to Frederick, Maryland, in the hospitals of which place he remained until January 27th, 1863, when he was returned to duty. He was discharged from service at post hospital, Detroit, Michigan, June 1st, 1863. Pension Examiner H. O. Hitchcock reports, under date of February 12th, 1864, that the ball still remains in the chest, causing great functional disturbance of the heart, pain, and prostration. Disability total.

CASE.—Lieutenant *J. H. Allen*, Co. G, 15th Virginia Infantry, received a gunshot wound of the left lung, implicating the pericardium, at Antietam, Maryland, September 17th, 1862. He was subsequently retired from service on account of endocarditis, resulting in structural change or organic disease of the heart, which rendered him perfectly unfit for field service. The case comes from a medical certificate for retirement, signed by the members of a Confederate Examining Board.

CASE.—Private Alexander Smith, Co. I, 100th New York Volunteers, aged 37 years, is reported by Surgeon M. S. Kittinger, 100th New York Volunteers, as having been discharged from service September 9th, 1862, on account of a gunshot wound through the right lung. Pension Examiner H. N. Loomis reports, October 19th, 1866: "The ball entered about three inches to the left of the spine and about the same distance below the apex of the scapula, passed between the ribs and through the left lung and escaped one and a half inches below the left nipple. The wounds are healed externally. He has constant cough, with expectoration of mucо-purulent matter, which, in the mornings, is mixed with blood. He has distinctly marked hypertrophy of the heart. The throbbing of his heart can be seen across the room. Pulse 92 and irregular. He is emaciated and weak, and has laborious breathing, accompanied with pain and a distressing sense of suffocation when he exercises. The cough and expectoration undoubtedly proceed from the unhealed wound of the lung. There is no doubt that the disease of the heart originates from the passage of the ball so nearly in contact as to produce organic change, first from the shock and then from subsequent inflammation." Smith died August 10th, 1869, of "hypertrophy and valvular disease of the heart, resulting from the wound." His attending physician has attended him for sixteen years and says he was a healthy man. His reasons for disputing the examiner's statement are not given.

CASE.—Private Jacob Bang, Co. D, 76th Pennsylvania Volunteers, aged 23 years, was wounded in the left breast by a conoidal ball, at Petersburg, Virginia, July 30th, 1864. Being at once conveyed to the field hospital, simple dressings were applied to the wound. On August 2d, he was transferred to the hospital at Fort Monroe; on the 7th, to De Camp Hospital, New York Harbor, and on September 13th, to Satterlee Hospital, Philadelphia, whence he was returned to duty October 19th, 1864. On October 24th, he entered Augur Hospital, Virginia, and was discharged from service January 1st, 1865. Pension Examiner H. S. Huber reports, February 2d, 1871: "The ball entered the chest one inch above the nipple, passed directly through the left lung, and emerged just below the lower angle of the scapula. Slight dulness on percussion and feeble respiratory murmur in the vicinity of the cicatrix. Disability total and permanent." It is added that the heart was injured.

CASE.—Private John W. Hopper, Co. B, 79th Indiana Volunteers, was admitted to Hospital No. 1, Louisville, Kentucky, February 28th, 1863, with a gunshot penetrating wound of the chest, received at Murfreesboro', Tennessee, December 31st, 1862. He was discharged from service March 29th, 1863. Pension Examiner Wilson Lockhart reports, May 15th, 1863: "The ball entered the posterior portion of the left lung and lodged somewhere in the region of the heart, affecting its circulation in such a manner as to induce a general dropsical condition. Pain and dulness at seat of injury. Disability total and permanent."

Formerly, punctured and incised wounds of the heart were met with most frequently,* but, at the present day, injuries from fire-arms are much more common. Of twenty cases

* The earlier recorded examples of temporary survival of wounds of the heart are mainly instances of stabs by swords or daggers. Paré was one of the first (in 1552, Lib. VIII, c. 32) to refute the prevalent doctrine that wounds of the heart were instantaneously mortal, adducing the example he saw at Thurin, of a duellist, who, after receiving a sword thrust in the heart large enough to admit the finger, pursued his opponent, thrusting at him several times, for two hundred paces, and then fell dead. Among the more interesting cases of wounds by the sword or knife are those recorded by PERCY (SANSON, Obs. 19), where the patient lived nine hours after the right auricle was freely laid open;—by BILLY (*Zodiacus medico-gallicus*, Genevae, Aprilis, 1680, obs. X), whose patient lived five days after a sword wound of the right auricle. Dr. Billings has recently acquired a copy of this very rare work, the first medical journal ever published, for the Surgeon General's Library. Billy's case is cited in the *Sepulchretum* of Bonetus, T. III, p. 376, and by Ollivier (*l. c.*, p. 252); by LEROUGE (in his edition of Saviard's *Recueil d'observations de Chirurgie*, 1792, obs. 113), of a soldier who resumed his avocations on the ninth day after receiving a stab in the right auricle, and died suddenly on the eleventh day at a cabaret. Ollivier regards wounds of the right ventricle as not only the most common but the least promptly fatal. For incised or punctured wounds of this cavity, see the cases

observed in the Army in the five years succeeding the war, eighteen were from gunshot, and two from stabs by knives. One of the latter furnished the Museum with a remarkable example of solution of continuity of bone by incision, as well as one of the heart with a gash in the right auricle.

The specimens of incised wound of the heart referred to and illustrated by the accompanying wood-cuts (FIGS. 244 and 245) were taken from a man killed in an affray at Fort Dodge, Kansas, June 2d, 1867. He had inflicted, with a large sheath-knife, several stabs upon his antagonist, when the latter, seizing his wrist, turned the point of the knife toward him, and suddenly drove the blade with great force into his chest, the handle still being grasped in his own hand. He fell at once, gasping for breath, his face deadly pale, and expired in about eight minutes. Assistant Surgeon C. S. De Graw, U. S. A., made an autopsy on the following morning. After cleanly dividing the sternum, the blade had traversed the mediastinum and freely opened the right auricle. The cavities of the heart were empty, the sac of the pericardium and the mediastinum were filled with blood.[1]

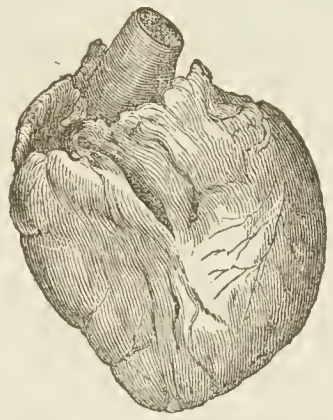

FIG. 244.—Heart, with an incised wound of the right auricle. *Spec.* 4870, Sect. I, A. M. M.

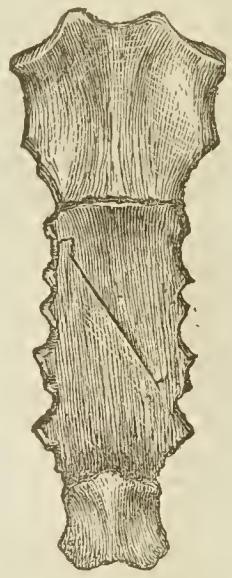

FIG. 245.—Sternum, showing an oblique incision through gladiolus. *Spec.* 4869, Sect. I, A. M. M.

The collection of the Army Medical Museum includes seven specimens of gunshot wounds of the heart,—five from pistol balls[2] and two from conoidal musket balls,[3]—a specimen of incised and one of punctured wound,[4] and two specimens of cardiac disease resulting secondarily from gunshot injury.[5]

The duration of life after wound of the heart is not proportionate to the extent of the wound.[6]

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of PANAROLI (*Iatralogismorum seu medicinalium observationes pentacostæ quinque*, Roma, 1652, Pent. V, obs. 45), life prolonged for four days; and a similar case is reported by JOBERT (*Arch. gén. de Méd.*, 1839, p. 209); those of BARTHOLIN (*Hist. anat. et med. rar.* Cent. I, Hist. 77); GARMANN (*Ephem. nat. cur.*, obs. 114, p. 228); BOYER (in Fourcroy's *Médecine éeclairée par les sci. phys.*, T. II, p. 92), are examples of incised wounds of the right ventricle, in which the patients survived five days. DURANDE reports (*Mémoire sur l'abus de l'ensevelissement des morts*, Strasbourg, 1789) a case in which a patient survived a sword thrust of the right ventricle fifteen days, and N. MULLER, according to Tulpius (*Obs. med.*, Lib. c. 113), saw a similar case. MORAND (*Opuscules de Chirurgie*, Sec. Partie, 1772, p. 184) presented the heart of a soldier to the Academy of Sciences, in 1835, exhibiting, in the right ventricle, a sword cut which caused no grave symptoms until the fourth day; the patient died on the ninth. DIEMERBROECK'S (*Anat. Corp. Hum.*, L. VI) patient walked sixty paces and lived ten days after a similar wound. VALSALVA'S (in Morgagni's cases, *Opera Omnia*, T. II, Epist. 53, art. 4, Patavii, 1765) patient, wounded in the same manner, died on eighth day; AUGE'S on the ninth (Marrigues, *Remarques sur les plaies du cœur*, Anc. Jour. de Méd., T. XLVIII, p. 244); those of ROY (Bonetus, *l. c.*, T. III, p. 357) and FANTONI (*Giornale di letterale d'Italia*, T. XXI, p. 148), not until the twenty-third day. Of sword wounds of the left ventricle, not immediately fatal, COURTIAL (*Nouv. obs. anat. sur les os*, 1705, p. 138) cites a case in which the patient walked five hundred paces and lived five hours; FRISI (*Il Filiatro Sebezio*, 1834, p. 37), one of death on the tenth day; FANTONI (*l. c.*, p. 145), one of a soldier who lived seventeen days.

[1] See Circular No. 3, S. G. O., 1871, *A Report of Surgical Cases treated in the Army of the United States from* 1865 *to* 1871, p. 91.

[2] Army Medical Museum, Sect. I, *Spec.* 837, pistol-ball perforation of left ventricle and right auricle,—survived one hour and a quarter; see details in text. No. 2639, a similar specimen, antero-posterior perforation of left ventricle near septum,—instant death; cited in text, also in *Boston Med. and Surg. Jour.*, Vol. LXXI, p. 292. No. 5688, laceration of right ventricle by a ball from a Navy revolver,—death instantaneous. No. 5929, oblique perforation of anterior wall of left ventricle by a small Derringer ball; cavity not opened (*see* Circular No. 3, S. G. O., 1871, p. 33); suicide,—lived twenty-seven minutes. No. 5949, pistol-shot through right ventricle,—survived fifteen minutes.

[3] Army Medical Museum, Sect. I, *Spec.* 1052, gunshot perforation of left ventricle (*Cat. of Surg. Sect.*, p. 453). No. 5648, gunshot laceration of right ventricle and auricle (Circular No. 3, p. 36),—death instantaneous.

[4] Army Medical Museum, Sect. I, *Spec.* 4870; cited in text. No. 5958, stab near apex in right ventricle by a jack-knife,—ran thirty yards and survived twelve minutes.

[5] Army Medical Museum, Sect. I, *Spec.* 504; musket ball imbedded between innominata artery and descending cava, provoking pericarditis (*Cat. Surg. Sect.* A. M. M., p. 453). This is the case referred to in connection with wounds of the innominata on p. 520. Further than that it was presented by Surgeon D. W. Bliss, U. S. V., and that it was removed from a patient who died in 1862 in Armory Square Hospital, with a gunshot wound of the chest, no information concerning the specimen or the clinical facts connected with it can be obtained. No. 2243, shaggy deposits of lymph upon heart and pericardium following gunshot wound (*Ibid.*, p. 454).

[6] This was illustrated in Dr. Carvallo's patient (*Spec.* 5929, mentioned in foot-note 2), also by the well-known case of Tour d'Auvergne, first grenadier of France, who died immediately from a superficial lance wound of the anterior wall of the left ventricle, received at Neustadt, July, 1798. Also by the case of the Sardinian prince, whose wife thrust a gold needle into his right ventricle, causing instant death. (SUE, *Aperçu général de la méd. lég.* In *Recueil périod. de la Soc. de Méd.* de Paris, T. VIII, p. 31, and the case of the Duc de Berri, recorded and treated by Dupuytren. I have not space to treat of the effect of the direction of the wound on the duration of life, or the relative frequency of wounds of the several cavities, or lodgement of foreign bodies in the heart, or of rupture of that organ.

Gunshot Wounds of the Mediastinum.—It is certain that even large foreign bodies may penetrate or pass through the mediastina, without injuring either lung or implicating any of the important organs contained in the mediastinal spaces. An interesting instance has been adduced (p. 486), and illustrated by Plate X, where the anterior mediastinum was very freely opened by a canister shot, and its contents exposed to view without sustaining serious injury, and the patient rapidly recovered, and now, after ten years, maintains a cheerfulness of temper as admirable as the fortitude with which he bore the suffering at first attendant on his wound. Other less surprising examples are noticed among the gunshot fractures of the sternum. The following is an additional case:

CASE.—Sergeant James G. Powers, Co. C, 57th Massachusetts Volunteers, was wounded at Petersburg, Virginia, July 30th, 1864, by a conoidal ball, which fractured the fifth and sixth ribs, and carried away a portion of the sternum. He also received a fracture of the middle third of the humerus. He was carried to the field hospital of the 1st division, Ninth Corps, where Surgeon W. V. White, 57th Massachusetts Volunteers, administered chloroform and ether and amputated the left arm at the junction of the middle and upper thirds by circular operation. He died August 16th, 1864. This case is supposed to be the one alluded to by Assistant Surgeon George M. McGill, U. S. A., medical inspector, in a letter to Surgeon T. A. McParlin, U. S. A. (then medical director of the Army of the Potomac), dated August 13th, 1864, in which he says: "Among the surgical cases there is one in hospital now of capital interest. The meso-sternum has been broken in two by a ball which lacerated the soft parts over it. The broken pieces of bone have been removed; the soft parts are gone (by sloughing and retraction after incision), so that an observer looks upon the heart invested with pericardium, and distinguishes plainly the diastole and systole of the auricles; at the same time the apex impulse can be felt. The wound is a human vivisection."

Abscess and sloughing of the loose areolar tissue which fill its interstices, attend some of the wounds penetrating the mediastinum:

CASE.—Private William Robertson, Co. H, 71st Pennsylvania Volunteers, aged 21 years, received at Antietam, Maryland, September 17th, 1862, a gunshot wound in the anterior mediastinum. He was admitted to Master Street Hospital, Philadelphia, on September 29th. The treatment consisted of nutritious diet and opiates at first; but, in November, the pain in the muscles became severe; yet yielded almost entirely to the use of expectorants; ulceration of the skin and sloughing of the cellular tissue finally complicated the case, and the patient died from exhaustion on November 17th, 1862. The case is reported by Surgeon Paul B. Goddard, U. S. V.

Wounds of the Thoracic Duct.—No instance is found in the surgical records of the war, of a wound of the thoracic duct, verified by autopsy, nor was there any example among the injuries of the chest of a case presenting symptoms that aroused the suspicion that this rare lesion* might be the main feature of the complications. Dr. Fraser observes (*op. cit.*, p. 101) that in the British army in the Crimea, "certain cases, where neither the lungs nor large vessels were wounded, but rapid and fatal sinking occurred, may be explained by the supposition that the thoracic duct had been injured." But the surgical historians of the Crimean campaign, Matthew and M. Chenu, do not specify any such cases.

Wounds of the Œsophagus.—Wounds of the cervical portion of this canal have been considered on p. 408. They are usually associated with wounds of the windpipe.

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* "Tellement rares," says M. LEGOUEST (*op. cit.*, 2me éd. p. 336), qu'on n'en possède pas d'exemple authentique: il est juste de reconnaître qu'elles peuvent passer inaperçues, au milieu du désordre des parties voisines qui doit nécessairement les accompagner." HENNEN (*op. cit.*, 3d ed. p. 404) remarks: "Of lesions of the Thoracic Duct, I shall not insult my readers by treating; the uncomplicated injury is barely *possible*; but art can do nothing toward its cure." I cannot conceive that it is disrespectful to the reader to advert to the sources of our limited information on the subject; but there may be some obscure reason, since Larrey and Guthrie and Baudens passed it over in silence. Professor S. D. GROSS (*op. cit.*, Vol. II, p. 459) tells us that Blumenbach refers to an instance. I cannot find the reference in J. FRIEDRICH BLUMENBACH'S *Medicinische Bibliothek*, Göttingen, 1783, in which the author confines himself to anatomical details observed by Sabatier, Hewson, and Pecquet. BONETUS, however (*Sepulchretum*, Vol. III. p. 360), cites from Bartholinus several examples of wounds of the chyliferous duct, characterized by the escape of a copious white liquid, *copiosus albicans humor*. CHELIUS (*op. cit.*, Vol. I, p. 501) remarks that injuries of the thoracic duct may be connected with penetrating wounds of the chest; but "as in these cases there must always be injury of the most highly important parts, the mortal result is usually not to be prevented." DEMME mentions (*Studien*, 1864, p. 114) that in the Italian War of 1859 he could learn of no instance of wound of the lymphatic duct. BRESCHET, in his article *Déchirements*, in the Dictionary in 60 volumes, T. VIII, p. 140, has collected from Morgagni (*op. cit.*, epis. XVI, § 7), Soemmering (*De morb. vasorum absorbentium corp. hum.* p. 52), Willis (*Pharm. ration.*), Lossius, Monro, Lieutand, and others, many instances of spontaneous laceration of the thoracic duct, but regards the case recorded by Guiffart as alone well authenticated. All the authors refer to the extravasation of a lactescent liquid in the cavities of the chest and abdomen as the principal sign of this lesion, and generally pronounce it speedily mortal, great emaciation supervening, if death is delayed.

Wounds of the thoracic portion must be very rare, as only a solitary instance appears on the reports of the war:

Case.—Private John Henry Jones, Co. E, 15th New Jersey Volunteers, was wounded at Spottsylvania, May 10th, 1864, by a conoidal ball, which entered the right arm posteriorly, passed forward and upward, comminuting and carrying away one and a half inches of the spine of the scapula, passed under the clavicle, opening the thoracic cavity behind the carotid vessels, fracturing the transverse processes of fourth and fifth cervical vertebræ, and lodged against the œsophagus. He was admitted to Lincoln Hospital, at Washington, on May 16th, and died May 20th, 1864. *Post mortem* examination revealed the course of the ball as described. The apex of the right lung was covered with lymph; there was ecchymosed blood in the walls of the chest, and fluid blood in its cavities. The walls of the gullet were lacerated, but not perforated; the spinal cord was congested, but no clot found in the canal; the kidneys and liver were congested and the gall bladder was distended. The case is reported by Assistant Surgeon J. C. McKee, U. S. A.

In this case, no symptoms peculiar to the wound of the œsophagus are recorded. Boyer (*l. c.*, T. V, p. 606) gives a full account of these injuries, with an interesting case of recovery after bayonet wound.

Wounds of the Nerves.—Baudens, whose practical observations it is always a pleasure to consult, declares that wounds of the phrenic nerve are not very rare,[1] and that they are indicated by pain in the diaphragm, by gastralgia, and generally by vomiting. These symptoms commonly subside in ten days or a fortnight, but are reëchoed by more persistent pains in the shoulder and arm, sometimes associated with paralysis, of which Baudens cites a good instance. Baudens also gives a good case of a gunshot wound lacerating the œsophagus and eighth pair of nerves, which proved fatal in twelve hours. The stomach was half filled with undigested food. There was no extravasation except of blood, for there had been no vomiting and no ingestion of food or drink. This observation corroborates the physiological views which ascribe to the division of the eighth pair low down the arrest of gastric secretion and of thirst and vomiting, the communication between the brain and viscera being destroyed. I have been unable to find in the records any cases that throw light on the effects of injuries of large nerves within the thorax. *A priori*, it may be inferred that various derangements in the functions of hæmatosis, digestion and respiration would be observed; but the complicated nature of these injuries appears to forbid any precise analysis. Dr. S. W. Mitchell, in his recent instructive monograph,[2] narrates the case of Private Warner, 18th Pennsylvania Volunteers, who received a gunshot injury to the anterior thoracic nerve probably, causing paralysis of the great pectoral muscle, and extension of disease to the brachial plexus. I find no special case of wound of the par vagum or other thoracic nerve noted in the returns.

Wounds of the Diaphragm.—The records contain references to one hundred and twenty cases of wounds of the diaphragm that came under treatment. Some of them have been described[3] with the wounds of the thoracic viscera with which they were associated, and others will come under notice with wounds of the abdominal viscera. Hence, it will be more convenient to continue this subject further on, where it will be abundantly shown that wounds of the diaphragm, though not invariably mortal, as the ancients believed, rarely heal, and leave always a liability to hernial protrusion.[4]

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[1] Baudens, *Clinique des plaies d'armes à feu*, Paris, 1836, p. 249.

[2] Mitchell, S. W., *Injuries of the Nerves and their Consequences*, Philadelphia, 1872, p. 212.

[3] See *ante*, cases of Perrin, p. 514, Stolpe, p. 515, Bowman, p. 516, Sheridan, p. 516. These four are examples of diaphragmatic hernia. For bayonet wound of the diaphragm, see case of Rae, p. 468. For examples of recovery after gunshot wounds of the diaphragm, see cases of Hope, p. 480, Collins, p. 471. See also case of Ackerman, p. 528.

[4] Consult, on this subject, Guthrie (*Commentaries, l. c.*, p. 499), Baudens (*l. c.*, p. 301), Friderici, *De diaphr. ex vulnere læso*, Diss. Jenae, 1671; Schenk, *De diaphragmatis nat. et morbis*, Diss. Jenae, 1671; Nélaton, *Élém. de path. chirurgicale*, T. III, p. 483; Legouest (*l. c.*, p. 363); Ettmuller, *Diss. de vulneribus diaphragmatis*, Lipsiae, 1730; Percy, *Dict. de Sci. Méd.*, T. IX, p. 214; Cloquet, *Dict. de Méd.*, T. X, p. 259; Devergie, *Médicine légale*, 3me éd., 1852, T. II, p. 35; Desault, *Jour. de Chir.*, T. III, p. 9; Mertens, *Vulnus pectoris complic. cum vulnere diaphragmatis*, Strassburg, 1758; Cavalier, *Observations sur quelques lésions du diaphragm*, Thèse de Paris, No. 362.

Section III.

OPERATIONS ON THE CHEST.

The ligations of the great arterial trunks and of some of their branches, the excisions of portions of the bony case, the extractions of splinters, missiles, and other foreign bodies, and the cases of thoracentesis will be considered in this section.

Ligations.—The cases in which it was found necessary, during the war, to apply ligatures to arteries of the chest, were sufficiently numerous, especially when viewed in connection with the examples of wounds of those vessels recorded in the preceding section, to constitute a valuable contribution to our information on this branch of surgery. No example of ligation of the primary carotid within the chest, for wound or aneurism, appears on the returns, and in the few cases of lesion of the innominata that came under treatment, it was not deemed feasible to place double ligatures on the vessel.

Ligations of the Innominata.—In the seventeen cases[1] in which this vessel has been tied, the operation was performed for traumatic cause in only a single instance,—when Hutin, after tying the subclavian, after Anel's method, for punctured wound of the axillary, on the appearance of intermediary hæmorrhage, placed a ligature on the brachio-cephalic. The patient survived the operation twelve hours. Success could not have been reasonably anticipated, as the conduct of the case was wrong in principle. In the solitary success among the operations for aneurism, the carotid and the vertebral were also tied, and recurrent hæmorrhage was controlled. In cases of punctured or gunshot wounds of the distal portion of the innominata, in which the bleeding has been temporarily controlled by compression,—such cases are recorded on page 520 and one in Dr. Blackman's practice, in which bleeding from a small puncture was restrained by digital compression for nearly a week,—I conceive that the correct operation theoretically would be to place a ligature around the middle of the brachio-cephalic, to tie the carotid and subclavian as near the bifurcation as practicable, and then to amputate the arm at the shoulder. In view of the discouraging statistics of ligations of the innominata for disease, such a proposal may be regarded as preposterous, but it must be remembered that we have experience of only one ligation of the innominata for traumatic cause, and that performed under hopeless circumstance;[2] that Mott and his successors, who failed in their operations on the brachio-cephalic, were not shaken in their convictions that the measure would ultimately be established as a means of preserving

[1] The operators, dates of operation, and duration of survival were: Mott, in 1818, 26 days; Graefe, in 1822, 67 days; Norman, in 1824, 60 hours; Arendt, in 1830, 8 days; Bland, in 1832, 8 days; Hall, in 1833, 3 days; Dupuytren's, Parisian colleague, in 1834, — days; Lizars, in 1837, 21 days; Hutin, in 1842, 12 hours; Cooper, in 1859, 9 days: Cooper, in 1860, 34 days; Pirogoff, about the same time [*Grundzüge der Allgemeinen Kriegschirurgie*, Leipzig, 1864, p. 459], 24 hours; Gore, in 186–, 17 days; Smyth, in 1864, recovery. In four cases the artery was exposed but not ligated because of the diseased condition of its coats, namely: by Porter, in 1831 (*Dublin Jour.*, 1832, Vol.); by Key, in 1832, death on the 23d day (Crisp, *On Diseases of the Blood-vessels*, p. 206); by A. Post, and by Hoffman. The brachio-cephalic artery is said to have been tied twice by Bujalsky (*Tabulæ anatomico-chirurgicæ ligandarum ateriarum majorum exponentes*, St. Petersburg, Elephant Folio, 32 pp. 14 pl.) I cannot refer to the magnificent work of the latter in which the cases are said to be recorded. Its companion, *Operationes lithotomiæ exponentes*, is in the Office library.

[2] I presume no one will question, at this date, that Hutin should have attempted to place double ligatures at the seat of puncture in the axillary, and, failing in this, to have amputated the arm.

life, and that the solitary success achieved by Smyth was attained by the removal of the sources of recurrent hæmorrhage. The operation suggested would not be more formidable, so far as the apprehension of shock is concerned, than the ablation of the arm with the scapula, or with the clavicle, operations that have been successfully accomplished for tumors of those bones. In a lean patient, if the bleeding could be stanched long enough to pass a ligature about the brachio-cephalic, the remaining steps of the operation would present no very serious difficulties. As, in a wound of the distal portion of the innominata, the probability that the application of a single ligature near the cardiac extremity would be futile amounts almost to a certainty, I believe that the measure suggested offers the sole forlorn alternative from the otherwise inevitable doom.

Ligations of the Subclavian.—There were five recoveries among the twenty-five ligations of the subclavian. These five cases will be reported in the order of the length of interval between the dates of injury and of the ligation. The operations were performed on account of primary hæmorrhage in one instance, twice for intermediary hæmorrhage from the axillary or one of its principal branches, once for false diffused aneurism and once for false consecutive aneurism. Three of the operations were on the left and two on the right side. Partial paralysis of the corresponding arm remained in three cases. In all five, the vessel was tied above the clavicle, near the acromial margin of the anterior scalenus. The patients were from twenty to twenty-eight years of age:

Case 1.—Corporal *G. M. Caughman,* Co. K, 13th South Carolina Regiment, aged 25 years, was wounded July 3d, 1863, the ball passing through the upper part of the chest, wounding the lung and the subclavian artery where it passes between the clavicle and the first rib. The subclavian was ligated on the inner side of the clavicle. The operation was successful; the patient was furloughed, with the wounds entirely healed, but with the left arm paralyzed, one of the nerves of the brachial plexus having probably been included in the ligature. The case is reported by Surgeon H. L. Thomas, P. A. C. S.[1]

Case 2.—Corporal Davis J. Palmer, Co. C, 8th Iowa Volunteers, aged 20 years, received a gunshot wound of left axilla at Shiloh, Tennessee, April 7th, 1862, the ball entering two inches below the clavicle, traversing pectoralis major muscle and lodging near scapula, after wounding the axillary artery; hæmorrhage occurred on April 8th. He was admitted to Floating Hospital Empress, on April 14th, and on the same day a tumor three inches in diameter, pulsating with an aneurismal thrill, bleeding when pressure on subclavian was removed, was ligated. An incision from the clavicular origin of the sterno-cleido-mastoid to near the border of the trapezius was made, the border of the scalenus anticus was found, and the left subclavian was ligated, with the greater portion of its sheath, chloroform having been administered. The condition of patient at time of operation was anæmic. Bottles of hot water were applied to relieve the excessive numbness of the left arm, and nourishing diet was given. He was transferred to general hospital at Keokuk, Iowa, April 20th, 1862. He was, on June 16th, 1863, mustered in as captain, Co. A, 25th Iowa Volunteers, and mustered out as lieutenant-colonel on June 6th, 1865. The ligature came away on May 20th, thirty-six days after the operation, and he was furloughed on May 29th, 1862. He was discharged the service on September 6th, 1862. The case is reported by the operator, Surgeon Thomas F. Azpell, U. S. V. Examining Surgeon William McClelland, Washington, Iowa, reports, May 21st, 1867: "Ball entered near collar bone, and was afterwards cut out at the lower edge of the shoulder blade. The muscles of the shoulder and arm are greatly absorbed, and, in consequence, the arm is very weak. He is one-half incapacitated from performing manual labor. Disability one-half and temporary. Still a pensioner in 1872.

Case 3.—Private *John T. Endy,* Co. F, 5th North Carolina Regiment, aged 23 years, was wounded July 2d, 1863; the ball entered one and a half inches below the left scapula, ranged forward, and lodged. There was great tumefaction and effusion about the shoulder, while the wound under the deltoid region was filled with clots of blood. Hæmorrhage supervened on the morning of the 16th, but was controlled by pressure and styptics; it occurred again the evening of the same day and was controlled in like manner. On the morning of the 17th, very profuse hæmorrhage took place, which could only be controlled by pressure over the subclavian artery. An exploration of the wound failed to discover the bleeding vessel, and it was determined to ligate the subclavian in its third division. The operation was performed without any untoward accident, but, while the hæmorrhage was lessened, the flow of blood could not be entirely arrested in the wound, even with the assistance of styptics; it was, therefore, decided to ligate also the supra-scapular artery, which had been exposed in the operation; this being done the hæmorrhage immediately ceased. The patient was put to bed with the arm warmly wadded, and at night there was sufficient temperature in the parts below the seat of ligature. The ligature from the supra-scapular came away on the tenth day and that from the subclavian on the thirteenth day. The patient got well without any bad symptom, and was furloughed August 31st, 1863. The ball was not discovered. Surgeon H. L. Thomas, P. A. C. S., reports the case.[2]

[1] Thomas, H. L., *Confederate States Medical and Surgical Journal,* Vol. I, p. 185.

[2] *Ibid.,* p. 185. It would be of interest to have the names of the operators.

Case 4.—Private Charles Wiggins, Co. G, 9th New York Heavy Artillery, aged 21 years, was wounded at Petersburg, March 25th, 1865, by a minié ball, which entered one and a half inches below the clavicle, and emerged near the upper third of the axillary border of the scapula. He was admitted to Finley Hospital, at Washington, March 29th. Intermediary hæmorrhage from the axillary occurred; and, on May 7th, the outer third of the right subclavian artery was ligated. He progressed favorably, and was discharged from service on August 3d, 1865. The case is reported by Surgeon G. L. Pancoast, U. S. V. Pension Examining Surgeon M. D. Benedict reports, August 2d, 1865: "musket ball through right shoulder and axilla, resulting in partial paralysis of corresponding arm and hand; limb is entirely disabled at present; will probably improve. Disability total. Duration two years." In 1872, this pensioner's name was still borne on the rolls.

Case 5.—Sergeant James Hickey, Co. M, 1st New York Veteran Cavalry, aged 28 years was wounded at Piedmont, Virginia, June 5th, 1864. Ball entered an inch below the centre of the right clavicle and passed directly through. On September 17th, he was admitted to Camp Parole Hospital, Annapolis, Maryland. There was aneurism of the axillary, subclavicular portion; bruit distinct; rough feeling to the touch. On September 19th, ligation of subclavian artery in its third portion was performed; chloroform and ether were administered; the condition of the patient was very good. On October 5th, the wound had nearly healed; the ligature had not come away; the arm and hand were cooler than natural; the aneurism was as distinct as before the operation; no pulse could be detected in the brachial, radial, or ulnar. He was transferred to Rulison Hospital, February 19th, 1865, whence he was discharged from service on May 30th, 1865. The case is reported by the operator, Surgeon F. H. Gross, U. S. V. Pension Examiner T. B. Reed, of Philadhlphia, May 21st, 1867, reports: "No use or power of right arm. Circulation very feeble, and atrophied muscular condition. Man is disabled from all labor by the aneurism alone. General health impaired. Is liable to rupture and death by any exertion." In 1872, this pensioner's name was still on the rolls.

Ligations of the subclavian in its third portion, for wounds of the axillary or the extreme distal portion of the subclavian, or for injuries of the vessels resulting in ulceration or gangrene and intermediary or secondary hæmorrhage, such ligations, as applications of the methods of Hunter or Anel (for the vessel was often tied very near the bleeding point) to wounded arteries, were quite often and very unsuccessfully employed. In the five following cases, the right subclavian was secured:

Case 6.—Private Harrison McMichael, Co. A, 57th Indiana Volunteers, aged 19 years, received a gunshot wound of the right side of the chest, at Franklin, Tennessee, November 30th, 1864, the ball passing beneath the clavicle and injuring the coats of the axillary artery. He was admitted to hospital at Nashville December 1st, 1864. The artery soon sloughed off at the junction of the axillary with the subclavian, causing hæmorrhage and threatening immediate death. On December 11th, chloroform was administered and the subclavian artery was ligated. He was treated with stimulants, but died from secondary hæmorrhage December 16th, 1864. The case is reported by the operator, Surgeon S. E. Fuller, U. S. V.

Case 7.—Private Thomas J. Conterman, Co. G, 48th New York Volunteers, aged 21 years, was wounded at Fort Darling, Virginia, May 9th, 1864, by a minié ball, which entered the right axilla, two and one-half inches above lower border of pectoralis major, and emerged two inches above posterior fold of axilla. He was admitted to St. Joseph's Hospital, New York City, on May 23d, and on May 31st, the right subclavian artery was ligated at outer third. At the time of operation the parts were swollen, sloughy, and painful, but sound at seat of ligation, patient feeble from loss of blood; pulse, 130; skin hot. Hæmorrhage recurred three times; the patient did not improve in any respect. On June 2d, chloroform was administered and a branch of axillary plexus of veins was ligated by division of pectoralis major. He died June 2d, 1864, three hours after the second operation and fifty hours after ligation of subclavian artery, from exhaustion. On autopsy, the subscapular artery was found to have sloughed three-fourths of an inch from origin; the axillary vein and an adjacent vein also. A wet preparation of the right subclavian artery is represented in the wood-cut (Fig. 246). It was contributed, with a history of the case, by the operator, Acting Assistant Surgeon George F. Shrady.

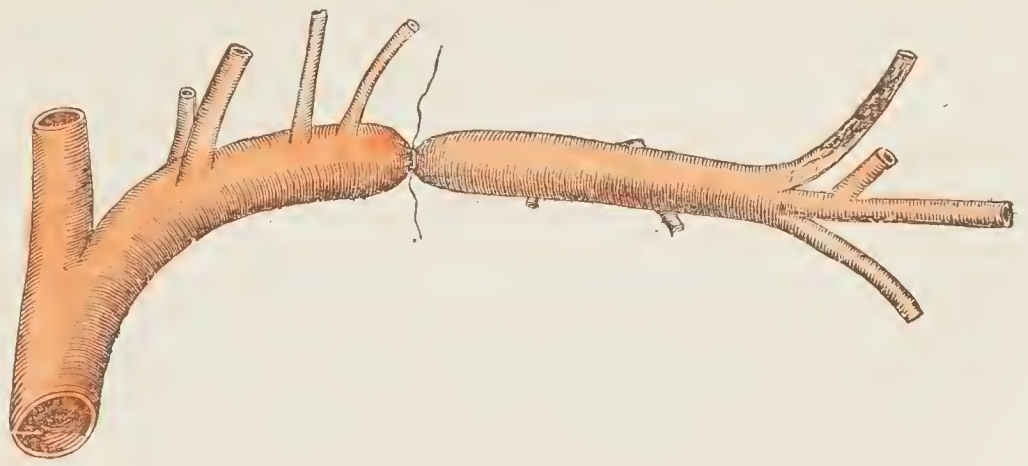

Fig. 246.—A posterior view of the innominata, right common carotid, and subclavian, with a ligature on its outer portion, of the axillary and some of its branches. There are anomalies in the origin of the vertebral and thyroid axis and the axillary divides into brachial and ulnar. The subscapular has sloughed. *Spec.* 4331, Sect. I, A. M. M.

Case 8.—Private Edwin Pfluger, Co. H, 2d Pennsylvania Heavy Artillery, aged 28 years, was wounded before Petersburg, June 27th, 1864, by a conoidal ball, which entered the right shoulder posteriorly and perforated the scapula just below the spine. He was admitted to the hospital at Fort Monroe on July 4th. On July 14th, intermediary hæmorrhage, to the amount of three pints, occurred. Assistant Surgeon Edward Curtis, U. S. A., ligated the axillary artery in its continuity, not far below the clavicle; hæmorrhage recurred on the 24th; and, on the 25th, Dr. Curtis ligated the subclavian artery in the third part of its course. Hæmorrhage recurred on the 27th, from the distal end of the axillary artery, but it was arrested by plugging the wound. The case terminated fatally on August 10th, 1864.

Case 9.—Private *J. W. King*, Co. C, 29th North Carolina Regiment, was wounded at Chickamauga, Georgia, September 19th, 1863, the ball passing through the right shoulder joint, fracturing and detaching the head of the humerus. The missile entered near the coracoid process and passed out over the spine of the scapula. The accident was followed by a high degree of swelling and inflammation, extending from the seat of injury down the forearm; suppuration copious and offensive, with high irritative fever. On October 10th, there was hæmorrhage from the anterior wound, which was arrested by pressure; on the 11th, the hæmorrhage recurred copiously from both wounds, and the subclavian was ligated in its external third. There was no further hæmorrhage, but gangrene attacked the wound of operation on the 20th, and the patient died the next day. The case is reported by Dr. H. L. Thomas.

Case 10.—Sergeant Henry B———, Co. D, 12th New Hampshire Volunteers, aged 21 years, was admitted to Emory Hospital, Washington, June 11th, 1864, with a gunshot wound of the right shoulder, received at Cold Harbor on the 3d. A minié ball entered below the clavicle and passed out at the anterior aspect of the arm, about three inches below the shoulder joint. He also received a flesh wound of the upper third of the right thigh. The patient had a hæmorrhagic diathesis, which his father stated was hereditary in the family—for example, a simple cut of the finger would cause hæmorrhage to such an amount as to endanger life. Under these circumstances, and upon consultation, it was decided after his first attack of hæmorrhage to ligate the subclavian. The operation was successfully performed on June 17th, by Surgeon N. R. Moseley, U. S. V. Strong hopes were entertained of the patient's recovery; but, unfortunately, in addition to his peculiar diathesis, he had a severe cough, which it seemed almost impossible to relieve or arrest temporarily. On the morning of the 29th, while in conversation, the artery gave way, and death was almost instantaneous from hæmorrhage. The adjacent wood-cut represents the specimen, which was prepared and presented, with the notes of the case, by Surgeon N. R. Moseley, the operator. I consists of a portion of the innominata and of the subclavian and carotid, and is figured in the wood-cut (Fig. 247). There were slight fibrinous exudations on either side of the point at which the ligature cut through. The commencement of the vertebral and superior intercostal are shown, and the thyroid axis and transversus colli.

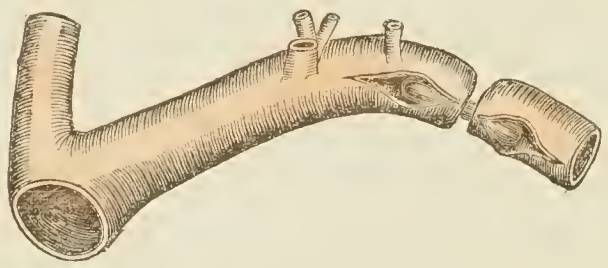

Fig. 247.—A posterior view of the distal end of the anonyma, the origin of the common carotid, and the right subclavian divided by a ligature in its third portion. The subclavian had been divided longitudinally behind to display the small fibrinous clot. *Spec.* 2812, Sect. I, A. M. M.

In the three following cases the left subclavian was tied:

Case 11.—Private Dexter W. I———, Co. B, 6th Connecticut Volunteers, aged 35 years, was admitted to hospital at New Haven, Connecticut, June 13th, 1864, with a gunshot wound extending under spine of left scapula, forward and inward toward cavity of the chest, received at Bermuda Hundred, Virginia, May 20th, 1864. There was gangrene in the wound the size of an orange, extending deeply into the tissues; secondary hæmorrhage occurred from branches of the axillary artery. On June 18th, the subclavian artery was ligated, in the outer third. On June 20th, there were chills, followed by all the symptoms of pyæmia. He was treated by the administration of morphia and whiskey, and bromine was applied to gangrenous parts. He died on June 24th, 1864. The wood-cut (Fig. 248) represents a wet preparation of a section of the left subclavian. The clot is well shown. Contributed, with a history of the case, by Acting Assistant Surgeon T. B. Townsend.

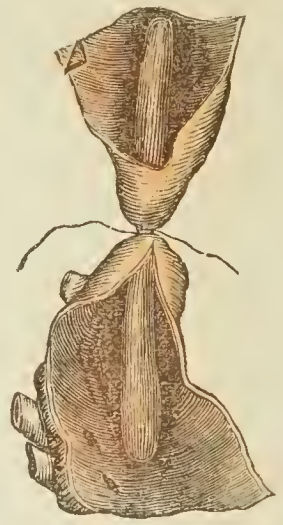

Fig. 248.—Coagulum in left subclavian six days after ligation. *Spec.* 4089, Sect. I, A. M. M.

Case 12.—Private J. H. Henderson, Co. F, 57th Pennsylvania Volunteers, was wounded at Fair Oaks, Virginia, May 31st, 1862, by musket ball, which entered the left arm in front of the insertion of the deltoid and passed out at the posterior border of the axilla. He was admitted to Judiciary Square Hospital, Washington, on June 4th. The humerus was uninjured; arm much ecchymosed. June 19th, there was copious hæmorrhage from the anterior wound. On June 23d, the left subclavian artery was ligated, in the outer third. At the time of operation there was great prostration from the hæmorrhage. No unfavorable symptoms till June 26th; then great mental excitement, patient asserting he was dying; was partially quieted by anodynes; no chills. He died from pyæmia June 27th, 1862. The case is reported by Acting Assistant Surgeon Francis H. Brown.

Case 13.—Private John Hites, Co. C, 7th Iowa Volunteers, aged 19 years, received a gunshot wound of the left axilla at Corinth, Mississippi, October 3d, 1862. He was admitted to the City Hospital, St. Louis, on October 15th, where, on October 22d, intermediary hæmorrhage occurred and the subclavian artery was ligated, in the third portion of its course. Hæmorrhage recurred on October 29th, and the patient died October 31st, 1862. The case is reported by the operator, Surgeon John T. Hodgen, U. S. V.

In the two following cases the artery was secured, according to the now little employed method below the clavicle, at the extreme distal portion of its course:

Case 14.—Private Benjamin Brannan, Co. B, 61st New York Volunteers, aged 22 years, received, at Spottsylvania, May 8th, 1864, a gunshot wound of the right shoulder and arm. He was admitted into the Campbell Hospital, Washington, on May 13th. Secondary hæmorrhage to the amount of forty ounces occurred on May 29th, and Surgeon A. V. Sheldon, U. S. V., ligated the subclavian artery in its continuity beneath the clavicle. The patient did well until June 15th, when the ligature came away and slight hæmorrhage occurred, which was arrested by compression, but recurred, and he died on the 19th. The case is reported by the operator.

CASE 15.—Color Sergeant Smith E. Dow, 4th New York Volunteers, aged 28 years, was wounded at Petersburg, Virginia, October 27th, 1864, by a ball, which entered near inferior clavicular margin, passing inward, downward, and backward, divided into two parts, and emerged near superior angle of right scapula. He was admitted to the Fairfax Seminary Hospital, Virginia, November 2d, 1864; there was extensive sloughing and suppurating, and on November 5th the right subclavian artery was ligated below clavicle. He was feverish and weak from loss of blood. Patient did well for ten days after the operation, when he was allowed to sit up. Ligatures removed; profuse hæmorrhage, four ounces; compression made. Eleventh day, hæmorrhage of four ounces; decided to ligate. Parts indurated; on pulsation artery could not be seen at its normal position; compression continued. He died November 18th, 1864, from recurring hæmorrhage, the artery having divided at point of ligation. Necropsy: Parts of the wound indurated; almost impossible to trace the course of arteries and veins; bony deposit below clavicle, implicating arteries and veins; subclavian artery divided at point of ligation; ends contracted two inches; upper end drawn inward from its normal position two inches. The case is reported by the operator, Assistant Surgeon Harrison Allen, U. S. A.

Traumatic Aneurism.—The following case of gunshot wound of the axilla was complicated by traumatic diffused aneurism, on account of which ligation of the subclavian was performed at a period of two hundred and sixty days from the date of reception of the injury. The distinguished operator vainly endeavored to carry out the correct rule of practice by ligating the axillary:

CASE 16.—Corporal Thomas Ward, Co. C, 2d Pennsylvania Reserve Corps, received a wound of the left axilla by a minié ball, at Mechanicsville, Virginia, June 25th, 1862. He was admitted to hospital at Washington, July 4th, 1862, and transferred to Philadelphia, September 2d. He was admitted to Christian Street Hospital on September 3d; on admission, both orifices of wound were healed. February 1st, 1863, swelling commenced in axilla. March 1st, there was some fluctuation in tumor; no bruit or thrill; an exploring needle revealed only extravasated blood; integuments discolored. March 14th, profuse arterial bleeding. On March 15th, the left subclavian artery was ligated, in its outer third, and an unsuccessful attempt was made to ligate the axillary, and a large quantity of extravasated blood was turned out of the axilla. At the time of operation there was excessive pain in the arm, ascribed to lesion of the brachial plexus; hypodermic injections of morphia had no effect, and cold-water dressings gave more relief than anything else; there was extreme prostration from hæmorrhage. Reaction never fairly set in, and he died on March 17th, 1863. The operation was performed by Dr. S. D. Gross, Professor of Surgery in Jefferson Medical College. The case is reported by Acting Assistant Surgeon John J. Reese.

In the following cases of circumscribed aneurism, resulting from gunshot injury, the subclavian was tied unsuccessfully on the thirty-eighth and the seventieth days from the reception of the original wound:

CASE 17.—Corporal William Broderick, Co. C, 199th Pennsylvania Volunteers, aged 39 years, was admitted into Hampton Hospital, Fort Monroe, on April 5th, 1865, with a gunshot wound of the left shoulder, received April 2d, 1865. Ball entered just below clavicle, outer side, passing through the thorax and emerging at the inferior portion of the scapula. Secondary hæmorrhage occurred several times; the aneurism was three inches in diameter. On May 30th, the left subclavian artery was ligated in the external third. The aneurism decreased very rapidly after the operation, and on July 8th, only a slight fulness was observed in the place of the aneurism; the wound united, except an inch at the external end of the incision. On the ninth day profuse hæmorrhage occurred, filling the original sac and the tissues in front of the shoulder. He died from exhaustion June 11th, 1865. *Post mortem* showed ligature yet on the artery, and a clot in the vessel on either side of ligation, not very firm nor adherent to inside of artery; one inch of axillary artery gone; no fibrinous deposit in the aneurismal sac; blood clot soft. The case is reported by Assistant Surgeon E. McClellan, U. S. A.

"CASE 18.—Private *J. B. Click*, Co. G, 5th Virginia Cavalry, was wounded, November 8th, 1863, at Brandy Station, by a minié ball, which entered the anterior fold of the right axilla about its middle, ranged through the axillary space, and was removed by counter incision between the spinal column and the vertebral border of the scapula. When admitted into the hospital, November 9th, the day after the reception of the wound, there was no indication of any more serious injury than is usual in flesh wounds. All of his symptoms were favorable, and he rested easy till the fifth day, when he complained of very severe pain, extending from the shoulder to the tips of the fingers. This was accompanied by sleeplessness, a costive state of the bowels, and great weakness. He continued suffering more or less in this way till December 3d. A small, hard, and circumscribed tumor was then detected for the first time under the tendon of the pectoralis major. This tumor increased rapidly in volume. On the 6th December, fluctuation and also pulsation became evident, and, on auscultation, a double sound similar to the bellows murmur of the heart. No thrill was perceptible either in the tumor or the radial artery. The symptoms were still too obscure to determine accurately its character, and opinion was very much divided. Some maintained strenuously that it was an abscess, from the very feeble pulsation and entire absence of all thrill, and also from the fact that pressure upon the subclavian over the first rib failed to diminish the size of a tumor. Others were disposed to regard it as an arterio-venous aneurism; and others again asserted that it was an extravasation of blood, produced by ulceration of the coats of a vein. On the 9th December, all pulsation in the tumor and in the brachial and radial arteries ceased suddenly. The bellows murmur also ceased. This was evidently due to great pressure upon the axillary artery by the greatly increased size of the tumor. An exploring needle was now introduced, and a few drops of grumous blood escaped, but no trace of pus could be detected. The diagnosis being still doubtful, he was suffered to remain until the 15th. A trocar was then introduced, when, as before, dark blood only escaped. It was then determined to ligate the subclavian. The operation was performed on the 16th, by Assistant

Surgeon J. C. Baylor, the artery being tied in the third part of its course. After the application of the ligature, a consultation was held as to the propriety of opening the sac, which, by the great pressure it exerted over the axillary plexus of nerves, was rapidly exhausting the patient. It was decided to lay it open by a free incision. This was accordingly done, and an immense clot exposed. On passing the finger into the clot, the artery spouted, and profuse hæmorrhage ensued that threatened a speedy termination to life. The clot was quickly turned out and several attempts made to secure the bleeding vessel, but they proved ineffectual, and as a last resort the tampon was used. The hæmorrhage was thus arrested, but the patient was left in an exceedingly feeble and prostrated condition. Stimulants were freely administered, but he sank rapidly, and died in eighteen hours after the operation. An autopsy held the next day revealed a lesion of the axillary artery just below the origin of the subscapular. The ligature was found firmly fastened around the subclavian, the inner and middle coats of which were divided. But, as a week had elapsed since all pulsation had ceased in the tumor and in the arteries below it before the operation was performed, time had been given for the establishment of anastomotic communication, and hence the hæmorrhage." Surgeon P. F. Browne, P. A. C. S., reports the case.[1]

Case 19.—"Private *K. P. Kahea*, Co. B, Jeff Davis Legion, aged 29 years, very large and muscular, while acting as scout near the Peaks of Otter, on June 14th, 1864, was shot with a minié ball through the left axilla; hæmorrhage represented as very profuse, notwithstanding which he rode eight miles, closely pursued for three miles. He spent several days in a private house, and was admitted to Campbell's Hospital on June 19th. The ball had passed through the tendons of the pectoralis major and latissimus dorsi, severing the axillary artery, apparently in its lower third; the hæmorrhage had ceased spontaneously on the first day and had not recurred; pulse imperceptible; very great swelling and hardness in the axilla, extending to the elbow, with great discoloration from ecchymosis; severe pain from shoulder to hand, with a sense of numbness, but not complete loss of sensation; the capillary circulation but little impaired, and temperature normal; when he sat up the veins of the forearm became much distended; wounds healthy and healing; pulse in the right arm feeble and frequent—above 100; appetite feeble; he slept but little, and then from the influence of opium. He continued in the same state, with little variation, for three weeks; sometimes we thought that we could feel a faint pulsation in the radial artery, but it was so slight as to be doubtful. Early in July, while the general swelling of the arm diminished, the tumor in the axilla was obviously enlarging and extending under the pectoral muscle, when, by the 8th, it became very prominent and as large as the fist. On the night of the 10th, a free arterial hæmorrhage took place from the posterior wound; after the loss of about a pint of blood, it was arrested by pressure, for an hour, upon the subclavian above the clavicle, and did not return; his pulse very feeble, and above 120; he was very much alarmed about his condition, indeed he had been unusually low-spirited from the first. On the 11th, for the first time, a distinct pulsation was felt in the tumor, both in the axilla and over the pectoral muscle; there was no perceptible thrill or bruit; from this time the tumor steadily increased in size, and the pulsation daily became stronger; there was also increase of the pain and numbness in the limb; constant fever and sleeplessness, and loss of appetite. It was decided, in consultation, to tie the subclavian above the clavicle, as affording him the best chance of recovery, although his general condition was not favorable for an operation. Accordingly on the 23d July, assisted by Surgeon Blackford and the rest of the surgical staff of this post, I ligated the artery where it passes over the first rib. The operation was rendered somewhat difficult by the unusual number of superficial arteries that required to be tied, and by the elevation of the clavicle from the tumor in the axilla. The pulsation in the tumor immediately ceased, and did not return; the swelling became less tense, but the pain continued, and the fever increased; the capillary circulation in the limb continued good, and its temperature appeared to be little, if at all, diminished (we had no thermometer to test it accurately), for a few days he seemed doing pretty well, but on the 26th, the incision presented an unhealthy appearance, with a slight erysipelatous blush and some swelling below the clavicle. By the 28th, the shoulder and breast became enormously swollen, so as completely to conceal the aneurismal tumor. On the next day there was extensive erysipelas on the outside and back of shoulder, which spread rapidly over the breast and down the arm to the elbow; the incision suppurating and unhealthy. On the same day, he was seized with a severe pleuritic pain on the left side, and great difficulty of breathing, but without cough; the respiratory motion was confined so exclusively to the right side, that the left seemed paralyzed, and was obviously several inches smaller than the right side, although auscultation showed the presence of effusion in the left thorax; bowels torpid and tympanitic; pulse 150, and very feeble. July 30th: No improvement in his condition, although the pain in the side had nearly ceased. July 31st: Prostration extreme; respiration more difficult; died soon after midnight. Autopsy: Axillary artery and vein both severed by the ball in their lower third; the axilla filled with a large clot extending to within three inches of the elbow and considerably beneath the pectoralis major. The coagulum was moderately firm, and contained in a thin adventitious sac of cellular tissue, but without any fibrinous deposit. The median nerve had escaped division, but was very much discolored, as were also the other nerves in the axilla. The artery, where ligated, had united, but not very firmly; no clot had formed within it, owing, probably, to the fact that the posterior scapular artery, instead of being a branch from the transversalis colli, arose directly from the subclavian, between the scaleni, and about two-thirds of an inch above the point of ligation; this would, probably, have led to secondary hæmorrhage after the separation of the ligature. There was a large serous effusion in the left side of the thorax, with a deposit of a thick layer of fibrin over a large surface of the lung; phrenic nerve healthy. There was also slight deposit in the pericardium, and some effusion. The only treatment that was admissible after the operation was morphine, stimulants, and tinct. mur. ferri. It would, probably, have been better to have tied the subclavian soon after his admission, when his general health was less impaired. But would the rules of surgery have justified the ligation of a large artery when there was no hæmorrhage and no pulsation in the tumor? The axillary swelling and absence of pulse at the wrist afforded strong presumptive evidence that the artery was divided, but we could not be sure that the absence of pulse was not owing to the pressure of the tumor, which might have arisen from the division of a branch of the axillary, and if so we might reasonably hope that in time it would be absorbed and the circulation restored. It was not until the tumor began to increase in size, with distinct pulsation, that we felt satisfied that an operation was indispensable, and our choice then lay between disarticulation and ligature of the subclavian—the ligature of the axillary in the midst of such

[1] Browne, P. F., *Confederate States Medical and Surgical Journal*, Vol. I, p. 23, 1864.

swelling and altered relation of parts was out of the question. We decided upon the ligation of the artery as being sanctioned by the highest authority; the more especially as his constitutional condition almost forbade the hope of successful amputation. I would suggest that, in a similar case, where the posterior scapular arose directly from the subclavian, it would be proper to tie it, as well as the main artery; in this case it could have been done without difficulty, as it could be plainly seen and felt where it crossed the cervical plexus. The other branches of the transversus colli and the supra-scapular would probably be sufficient to supply the anastomosing circulation. The immediate cause of death in this case was pleuritis, which has been observed to be far the most frequent cause of death after ligation of the subclavian. The erysipelas, to which there has latterly been some tendency in this neighborhood, no doubt also contributed to the fatal termination." Surgeon Wm. Selden, P. A. C. S., reported the case.[1]

The next case refers to a ligation of the left subclavian, by Surgeon John A. Lidell, U. S. V., for circumscribed traumatic aneurism following the division of the axillary by a carbine ball. The complete report is given in the author's own language:[2]

CASE 20.—"Captain *John F. Jordan,* Co. B, 13th Virginia Cavalry, aged 31 years, and of sound constitution, was admitted to Stanton United States Army General Hospital, June 23d, 1863. He had been wounded on June 21st, in action near Middleburgh, Virginia, by a shot from a carbine. The bullet, which, by the way, was conical in shape, penetrated the pectoralis major muscle of the left side, at a point on a level with the axillary artery, and about one and a half inches from the margin of the armpit, passed directly backward beneath the shoulder, wounding the axillary artery, together with the brachial plexus of nerves, and escaped behind. Patient said he lost a great deal of blood immediately after the wound was inflicted, so much indeed that he fainted, when the hæmorrhage ceased of itself, and did not return. On admission to hospital, his left arm exhibited some swelling, œdematous in character, and its inner side was ecchymosed nearly down to the elbow-joint. It was also paralyzed, the loss of both sensibilty and mobility being complete. There was no radial pulse in that arm, and pulsation could not be detected in the brachial or any other artery thereof. From this we inferred that the axillary artery had been severed by the bullet. The temperature of the limb was not below the normal standard; on the contrary, we thought it to be somewhat warmer than the limb of the opposite side. There was nothing remarkable in the appearance of the wound. The patient's general condition was good. He did not look as if he had suffered from hæmorrhage. His bowels were constipated; ordered a saline purge, together with a spare diet, and, with a view to lessen the tendency to secondary hæmorrhage, he was directed to remain quiet in bed, to exert himself as little as possible, and to have ice applied constantly over the injured artery. He was also directed to take morphine at night if necessary to procure rest. Under this treatment the patient progressed without an unfavorable symptom; the wound cleaned itself and closed up in a satisfactory manner, and we congratulated the patient in that he was likely to get well without suffering the terrible secondary hæmorrhage, which frequently attends gunshot wounds of the axillary artery. The limb continued to be completely paralyzed as to motion, but sensation had gradually been restored to the fingers, hand, and forearm. On the morning of the 12th of July, we noticed the appearance of a small, rounded, circumscribed swelling of the size of an egg, at the seat of injury to the artery. The scar of the anterior orifice of the gunshot wound was exactly on the summit of the convexity of the swelling, as the patient lay in bed. The tumor was tense in feel, and pulsated distinctly and synchronously with the heart. There was, however, an entire absence of the aneurismal thrill and aneurismal bruit. By compressing the subclavian artery against the first rib, the tumor became soft, much less in size, and ceased to pulsate. On withdrawing compression the tumor speedily filled up, became tense, and pulsated again. Patient stated that during the preceding night he felt something "give way" in his left armpit, while attempting to change the position of this arm by the aid of the right hand. During the day the aneurism increased rapidly in size, and in the evening was fully twice as large as when first noticed in the morning. July 13th, the aneurism continued to increase steadily in size, and in the evening was about half as large as the clenched fist. July 14th, the aneurism had grown but little since previous day; it was still rounded, distinctly circumscribed, and somewhat oval in shape. By compressing the subclavian, it ceased to pulsate, became soft and much shrunken, but the prior condition of things was restored speedily on withdrawing compression; as on a previous occasion, there was still no thrill or bruit. Diagnosis: *Circumscribed traumatic aneurism of the axillary artery.* From the entire absence of pulsation in all the arteries beyond the aneurism, which existed even at the time of admission to hospital, and the complete want of thrill and bruit in the aneurism itself, we believed that the aneurism had been developed from the proximal end of the severed artery, and that opinion was strengthened by the fact that the swelling had not expanded outward and downward into the armpit, where there was but little in the anatomical structure of the parts to obstruct its growth, any more rapidly than it had done in another direction, where it was covered over and bound down by the pectoral muscles. The swelling had expanded so equally in all directions, that the scar of the anterior wound still remained exactly over the centre of the tumor, as when we first saw it. The aneurism was so distinctly circumscribed that, although its origin was traumatic, it was deemed advisable to attempt a cure of it by the Hunterian method. As there was not sufficient space to secure the artery below the clavicle without opening the sac, I proceeded to tie the left subclavian artery external to the scalenus, on the afternoon of that day (July 14th). The patient being under sulphuric ether, that operation was performed without difficulty by the ordinary method. On tightening the ligature the tumor ceased to pulsate, shrunk a good deal, and became soft. The left arm was directed to be wrapped in cotton wool, and to be kept warm by the further aid of bottles of warm water, to be renewed from time to time as occasion might require. A full dose of morphia was prescribed. He was enjoined to preserve the recumbent posture, and to avoid exertion of every kind. A milk diet was allowed. July 15th, patient had a comfortable night; temperature of arm not diminished; discontinued the warm water. July 16th, patient doing well in every respect; arm warm; color thereof good; discontinued the cotton wool. July 17th, bowels being confined, he took an ounce of sulphate of magnesia. July 19th, aneurismal sac opened spontaneously last

[1] SELDEN, W., *Confederate States Medical and Surgical Journal,* Vol. I, No. 9, p. 134, September, 1804.

[2] LIDELL, *On the Wounds of Blood-vessels, Traumatic Hæmorrhage, Traumatic Aneurism, and Traumatic Gangrene.* In Surgical Memoirs of the War of the Rebellion, Vol. I, p. 101, New York, 1870.

night through the anterior scar of the gunshot wound, and discharged two or three ounces of very dark-colored blood, mixed with pus. Suppuration of the sac had been threatened ever since the day after the operation. He was allowed a full diet. July 20th, a moderate discharge of old blood and pus, accompanied with a gradual diminution in the size of the aneurism, and but a moderate degree of inflammation of the sac continued on this and several days following, the patient's general condition being unexceptionable all the while. July 27th, the aneurismal swelling had entirely disappeared; suppuration of the sac, moderate in quantity, still continued, the pus being of a good quality. August 1st, *the ligature separated and was removed to-day, without the occurrence of hæmorrhage or any other difficulty;* discharge from sac good in quality and steadily diminishing in quantity; discovered some excoriation at the inner side of the left elbow, occasioned probably by pressure, the patient having followed very closely the injunction to keep as still as possible in the recumbent posture; directed a stimulating plaster to be applied, and the pressure to be removed to other situations by arranging pillows. August 5th, discharge from sac had subsided to a small quantity of healthy pus, and the orifice was manifestly contracting. We hoped that adhesion of the sac was taking place. Patient's condition seemed to be favorable in every respect, except that he had been losing flesh rapidly for several days without obvious cause. For want of any other reason, we attributed it to the extreme heat of the weather, the temperature both day and night having been unprecedented ever since July 25th, the mercury at midday ranging from 90° to 100° in the shade, and seldom falling below 80° at night. August 6th: a profuse flow of blood from the sac came on this morning without warning; the loss of blood being so rapid as to threaten speedy death. The officer of the day was close at hand, and stopped the bleeding by injecting about one ounce of liquor ferri persulphatis into the bottom of the sac, through a female catheter, introduced for the purpose. The hæmorrhage ceased immediately. We had been emboldened to use the persulphate of iron freely in this way, because we had a few weeks before (June 22d) stopped a troublesome secondary flow, in alarming quantity, of arterial blood from the cavity of a large abscess, associated with gunshot fracture of the right thigh, by injecting about two drachms of liquor ferri persulphatis through a catheter, carried into the neighborhood of the supposed source of the hæmorrhage, a branch of the profunda artery, and no unpleasant effect of any kind followed it. Again, about the same time, we had been troubled to manage a case of general oozing of blood from the cut surface of a thigh, amputated secondarily for gunshot injury. After trying exposure to the air, ice-water, and even ice, without effect, we stopped this bleeding immediately by covering the end of the stump with pledgets of lint soaked in liquor ferri persulphatis. Aside from pretty severe pain, which soon subsided, no unpleasant consequence of any kind followed. We did not discover any evidence of even the feeblest action as an escharotic, and indeed have since thought that the case progressed better than other amputations of the same class. In consequence of the secondary hæmorrhage and the efforts to repress it, the aneurismal sac became filled up again to the original size. August 10th, another severe hæmorrhage occurred from the same orifice; it was readily stopped by again injecting persulphate of iron in solution. August 11th: profuse hæmorrhage occurred to-day through the opening of the posterior orifice made by the bullet, after it had been healed for more than a month. This bleeding was also suppressed immediately by injecting liquor ferri persulphatis through a catheter. After this there was no more hæmorrhage. During the next few days he seemed to rally from the depression produced by these repeated losses of blood. He was ordered to have wine, and anything in the line of supporting treatment that he would take. August 18th: the aneurismal sac has again suppurated, and there is a profuse discharge of dark-colored and very offensive pus. August 25th: patient failing rapidly; suppuration very profuse and extremely offensive in character. August 29th, he died worn out with the suppuration and the hæmorrhages, forty-six days after the operation, and twenty-eight days after the ligature came away. Autopsy eighteen hours after death: Emaciation extreme; rigor mortis moderate; a large elongated cavity, with ragged dark-colored walls, occupies the original seat of the aneurism, and extends beyond it outward into the axilla; the axillary artery is found to have been severed obliquely by the bullet about one and one-half inches above its termination in the brachial; the divided extremities are separated widely apart (to the extent of about three inches); the distal end appears to have been pushed away from the proximal end, either by the original aneurism, or the subsequent hæmorrhages and suppuration; the proximal end is oblique and closed, while the bruised and lacerated portion of it appears about to be cast off by the ulcerative process, as a distinct line of demarcation has been formed; the distal end is oblique and unclosed, but the calibre of the artery is contracted down to about a line in diameter, and it is blocked up by a coagulum three-eighths of an inch long; the branches of the axillary given off above the point of injury, especially the superior thoracic and the acromial thoracic, are much enlarged; the axillary vein is greatly diminished in size about the track of the bullet, but it is still pervious; the brachial plexus of nerves was also wounded by the bullet, all the trunks being cut off except that of the musculo-spiral and circumflex nerves. The proximal extremities of the divided trunks were somewhat bulbous. At the seat of the operation the wound, which at one time was nearly closed, is now open quite down to the artery at the point of ligation, the new granulations having been reabsorbed to that extent, but the artery for a distance on each side thereof is surrounded by a dense mass of new connective tissue, so thick and dense as to make it a little difficult to get at and remove the specimen without injury. On the proximal side of the ligature the vessel is blocked up to a distance of about five-eighths of an inch; on the other side of the ligature it is blocked up to the extent of about two-eighths of an inch. In the cavity of the thorax we find old pleuritic adhesions on both sides, and old tuberculous cicatrices at the apex of each lung; but both lungs are now entirely free from tuberculous deposits: abdomen not opened." The specimen, represented in the above wood-cut (FIG. 249), and also specimen 3243, showing the brachial plexus, were contributed by the operator.

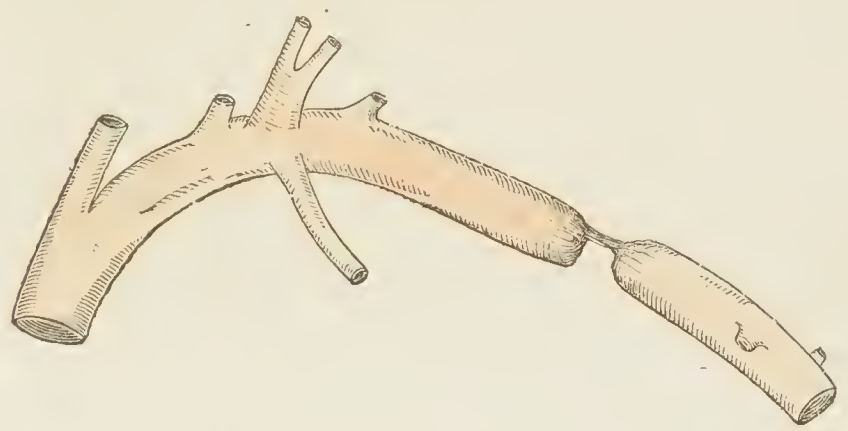

FIG. 249.—Drawing of the arterial preparation from Dr. Lidell's case of ligation of the left subclavian. *Spec.* 1684, Sect. I, A. M. M.

CASE 21.—Sergeant Henry Grothenn, Co. K, 5th United States Cavalry, aged 28 years, was admitted into the McClellan Hospital, Philadelphia, June 23d, 1863, from Lincoln Hospital, Washington, with an aneurism of the right axillary artery, the result of a gunshot wound received at Beverly Ford, Virginia, June 9th, 1863. The ball had passed in on the anterior part of the arm, near the shoulder-joint, and was cut out at Lincoln Hospital an inch below the inferior angle of the scapula. In a report of the case in the *American Journal of Medical Sciences*, Vol. XLVII, p. 128, N. S., Acting Assistant Surgeon Isaac Norris says: "When I took charge of the ward, on July 26th, the patient was absent. He returned on the 28th, and after making a careful examination of the arm, the true nature of the disease became manifest, as the pulsation of the tumor—at that time about the size of a large horse-chestnut—was very apparent, and, upon auscultation, the aneurismal thrill could be distinctly heard, corresponding with the contraction of the left ventricle of the heart. My predecessor had had made an apparatus composed of a compress of lead with screws so arranged that by tightening them any amount of pressure desired could be placed upon the part. The apparatus was adjusted, but after a trial of some thirty hours, it was abandoned on account of the pain it gave the patient, and a padded bandage was substituted, in the faint hope that it might be of use. This was worn for nearly ten days, but it was finally left off, and the treatment was reduced to keeping the arm, as nearly as possible, at perfect rest. On the 16th of August last, the aneurism became much larger, and from the pressure upon the axillary plexus of nerves, caused him great pain. The following evening it was decided to operate and tie the subclavian, despite the hazard attending it. The aneurism broke, unfortunately, early the next morning, before the operation could be performed, and the patient lost from thirty to forty ounces of blood. The hæmorrhage finally ceased of its own accord, but he was so weakened and exhausted from the great loss he had sustained, that it was the opinion of the medical staff of the hospital, upon consultation, that, if anything was attempted then, he would die under the operation, and that his life might be prolonged for a few hours more by keeping up digital compression upon the artery. This was accordingly done, and the assistants appointed, relieved each other every hour or two, until the arrival of Surgeon R. H. Coolidge, medical inspector of the Army, on a chance visit to the hospital, who at once became interested in the case, and thought the subclavian should be tied without delay; the temporary absence of Dr. Taylor, the surgeon in charge, being the objection to its performance. As the patient seemed to be rallying each hour, Dr. Coolidge decided to return to the hospital in the afternoon, and operate, if no objection then existed. Upon his return, the hæmorrhage again having commenced, he proceeded to ligate the subclavian in the third part of its course. I here give the account of the operation as furnished by the Doctor: 'The patient came easily under the influence of the chloroform, and the operation was performed carefully and deliberately. The loss of blood amounted to a few drops only, hæmorrhage from the aneurism having been completely arrested by a tourniquet. Chloroform was not administered after the operation began. The artery, on being exposed, was found closer to the brachial plexus than usual, and it was also quite deeply seated, the patient being a large muscular man. An armed artery needle having been passed beneath the vessel from below upward and outward and withdrawn, it was found by the operator, and his assistants also, that the inferior cord of the brachial plexus was included in the ligature, a result attributed in part to the want of sufficient curve in the needle. Another one, having a more abrupt curve, being armed and passed beneath the artery, it was elevated by the first ligature, and care taken to exclude the nerve above mentioned. The first ligature was then withdrawn, and several of the medical officers present, having examined the parts, and satisfied themselves that nothing but the artery was embraced in the ligature, the knot was tied, the lips of the incision drawn together, and the patient placed in bed.' Everything seemed to do well until about eight o'clock P. M., when the patient complained of considerable pain in the region of the wound. Morphia was given to him freely, and repeated the following hour, but without the effect of quieting him. The patient, from that time, grew rapidly worse, suffering with great dyspnœa, and at midnight expired, six hours after the operation. The *post-mortem* revealed the unexpected fact that a nerve of considerable size, lying immediately posterior to the artery, had been included in the ligature despite the care that had been taken to prevent it. It is to be regretted that this nerve was not traced to its origin and termination; all that can now be said, is that it was followed as a single cord down to and upon the posterior wall of the aneurism. It was certainly neither of the two cords of the brachial plexus, and its situation was, beyond doubt, abnormal, as the nerve included in the ligature was directly opposite the knot, and cannot be seen when the artery was placed in its proper position. It is scarcely necessary to add that no writer on anatomy has described such a nerve, nor has any dissection on record shown the existence of one, previous to this. At the time the ligature was tied, the patient was but slightly under the influence of chloroform, and no pain was manifested until several hours afterwards. The preparation is an exceedingly instructive one, the aneurismal sac being very large, and the course of the artery well shown. The infiltration of blood also into the surrounding cellular tissue was very great." The specimen, consisting of the aneurismal sac and the subclavian, with a ligature on the third portion, is represented in the accompanying wood-cut (FIG. 250.) It was contributed, with the notes of the case, as subsequently published by Acting Assistant Surgeon Isaac Norris, jr.

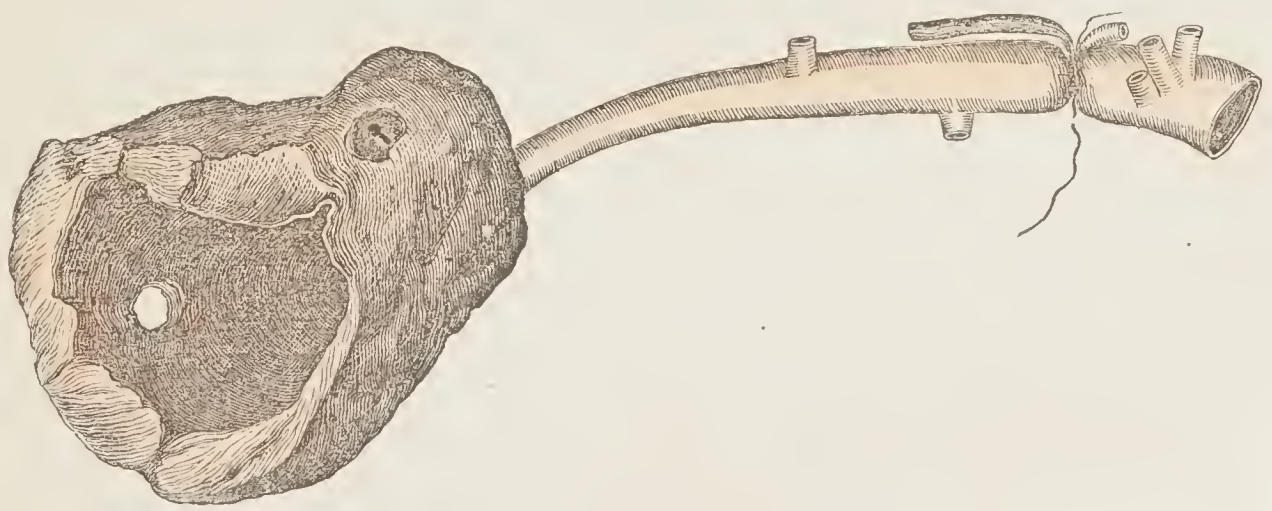

FIG. 250.—Traumatic aneurism of the right axillary, with ligation of the subclavian. *Spec.* 2609, Sect. I, A. M. M.

Some surgeons describe the ligation of the subclavian behind or between the scaleni as a distinct operation. The vessel appears to have been secured on the left side, in this portion of its course in the two following cases. They are both illustrations of Anel's method unsuccessfully applied to wounded arteries. The first was for intermediary hæmorrhage on the eighth day; the second for secondary hæmorrhage on the eighty-ninth day, the result of gangrene:

Case 22.—Corporal George M. Klechner, Co. D, 93d Illinois Volunteers, aged 23 years, received at Allatoona, Georgia, on October 5th, 1864, a gunshot wound of the left arm; the ball entering at insertion of deltoid muscle, lodged between the clavicle and first rib, over the tubercle of the rib. He was admitted to the general hospital at Rome, Georgia, October 8th, 1864, and, ton October 13th, the subclavian artery was ligated behind the scalenus anticus and the ball removed; chloroform and ether were administered. At the time of operation, there was excessive infiltration of serum in all the parts involved in the operation, and profuse secondary hæmorrhage, with extreme prostration therefrom. Stimulants were freely administered, but he died six hours after the operation. The case is reported by the operator, Surgeon J. H. Grove, U. S. V.

Case 23.—Sergeant *W. H. Holshowes*, 3d South Carolina Battery, was wounded at Franklin, Tennessee, November 30th, 1864, by a conoidal ball, which entered about an inch below the left clavicle and lodged in the substance of the lung. He was treated in the field until December 26th, when he was transferred to No. 1 hospital, Nashville. About February 23d, 1865, a large gangrenous ulcer formed, which spread rapidly, involving the tissues from the inner third of the clavicle to the axilla, exposing the blood-vessels and nerves. The subclavian artery sloughed in its distal third on February 27th; about twelve ounces of blood were lost. The patient was much reduced. Surgeon B. B. Breed, U. S. V., administered chloroform and ligated the left subclavian artery between the scaleni through an incision above the clavicle. Tonics, stimulants, and a nutritious diet were given and disinfectant dressings were applied. The gangrene was arrested with difficulty. The patient did well until the eighth day after the operation, when he was attacked with severe rigors, which occurred at irregular intervals until March 11th, 1865, when death resulted from pyæmia. The necropsy showed a firm clot in artery. Multiple abscesses existed throughout both lungs. Thrombi in the subclavian.

Two cases of ligation of the right subclavian on the tracheal side of the scaleni are recorded. In the first of these formidable operations, the patient survived the operation only half an hour:

Case 24.—William S———, a scout for General Milroy, was admitted into Cumberland Hospital, Nashville, December 1st, 1864, having been wounded while on a scouting expedition on or about November 15th; while taking supper at a farm-house he was fired at through the window, the ball striking about the external third of the right clavicle, fractured it, passed obliquely inward and backward, and emerged on the back near the cervical vertebræ. The pleural cavity was opened by the ball, and whenever he changed his position a quantity of fluid, having the appearance of blood mixed with serum, would flow out. Compresses were kept on the wound, and whenever they were taken off there would be a discharge of the bloody fluid. The quantity lost at different times was great, and the patient's strength failed rapidly. On the evening of December 14th, a severe hæmorrhage occurred from the subclavian artery, which was controlled for some time by pressure. The necessity of surgical interference was urgent, as the patient had already lost a large amount of blood. Assistant Surgeon S. C. Ayres, U. S. V., immediately operated. A triangular flap was made by cutting parallel with the upper border of the clavicle and along the inner border of the sterno-mastoid—the two incisions meeting at the sterno-clavicular articulation. The sternal and part of the clavicular insertion of the sterno-mastoid, as well as the sternal attachments of the sterno-hyoid and sterno-thyroid muscles, were divided and turned backward with the ends of the fingers and the cellular tissue carefully divided with a grooved director. The par vagum was recognized and drawn inward, and the internal jugular vein outward. The artery was found lying quite deep below the clavicle; with some difficulty the aneurism needle was passed around the artery from below upward and the ligature drawn. Hæmorrhage ceased from this moment, but it was evident that the patient was sinking rapidly. He died in about half an hour. If the hæmorrhage had not occurred he could not in all probability have lived many days. Autopsy twelve hours after death: Body much emaciated. The ball had fractured the outer third of the clavicle and the first rib. It had opened the pleural cavity in its course and had fractured the spinous processes of the seventh and eighth cervical vertebræ, and had made its exit on the left side of the spinal column. The hæmorrhage from the subclavian was occasioned by a sharp spicula of bone which had caused ulceration of the coats of the artery. The right pleural cavity contained a large quantity of bloody serum, such as was discharged from the wound previous to death, and the lung was found completely hepatized. It is probable that a vein was ruptured by the ball in its course, and that the bloody fluid discharged from the pleural cavity before the arterial hæmorrhage occurred was a mixture of venous blood and serum; but, from the disorganized condition of the tissues, it was impossible to tell which branch had been severed. The wood-cut (Fig. 251) shows the innominata, right carotid, and subclavian arteries, with a ligature *in situ* on the subclavian three-fourths of an inch from its origin. It was contributed, with a history of the case, by the operator.

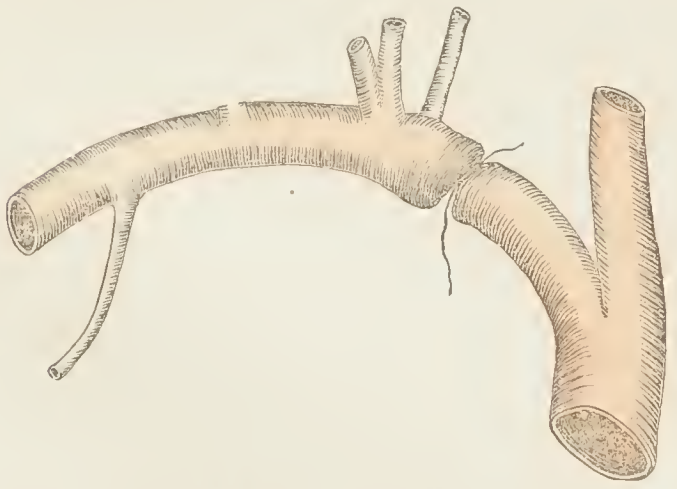

Fig. 251.—Ligature on the first portion of the right subclavian. *Spec.* 4729, Sect. I, A. M. M.

Case 25.—Private Adam Grimm, Co. D, 7th Connecticut Volunteers, aged 21 years, was wounded before Petersburg, Virginia, June 9th, 1864, by a rifle ball, which fractured the acromion end of the right clavicle, passed beneath the scapula and out below the lower border, and, on the 11th, admitted to Hampton Hospital at Fort Monroe, and some fragments of bone were removed. The wound looked healthy and continued discharging laudable pus and granulating until June 28th at 11 A. M., when secondary hæmorrhage occurred and the patient lost about six ounces of arterial blood, before the bleeding could be arrested by pressure. On the 29th, hæmorrhage again occurred, more severely than before, losing from fourteen to sixteen ounces of blood. The cavity of the wound was by this time much enlarged. The hæmorrhage was again apparently checked by plugging the wound with lint saturated with perchloride of iron, but in two hours the whole of the tissues between the wound and the neck were engorged with blood, the swelling rapidly increasing, and thus showing that he was still bleeding. After consultation it was decided to stimulate freely and give narcotics to relieve pain, and let him remain till morning. June 30th, 11 A. M., being in about the same condition—the tongue dry and glazed, pulse 120 and very weak, and with the engorgement gradually increasing—the subclavian was ligated successfully in the first part of its course. Coagula were then removed from the cavity of the wound, and it was syringed with ice water, no bleeding being apparent. Immediately after the operation he rallied; the tongue became moist; pulse at left wrist 110, at right wrist *none*. The temperature of both arms was the same and continued so throughout. July 1st, 10 P. M., left pulse 110, right barely perceptible. Patient in good spirits; takes nourishment freely, but complains of pain in swallowing. 10 P. M., left pulse 112, right same as in the morning. A sedative was administered. July 2d, left pulse 110, right increasing a little in strength. The patient improved somewhat until the 7th, at which time the left pulse was 90 and the right still increasing in strength. He complained of pain in the region of the heart, but no abnormal sounds were heard. July 8th, left pulse 120; tongue dry and glazed; at 9 P. M., he had a rigor. July 8th, 7 A. M., a slight hæmorrhage occurred from the point where the artery was ligated; the wound was plugged and pressure employed; at 10 A. M., the hæmorrhage recurred more severely than before. From this time until evening there were repeated hæmorrhages; the patient gradually sank and died at 8 P. M., remaining sensible to the last. Necropsy: Both the supra-scapular and posterior scapular arteries were found to be in a sloughing condition, which was apparently the cause of the last hæmorrhages. The subclavian was ligated about half an inch from its origin. The ligature had come away and the coats of the artery were ulcerated through. On the cardiac side a slight clot had formed, but on the distal side the clot was larger, firmer, and more perfectly organized. The case is reported by Dr. Alexander R. Becker,* of Providence, Rhode Island, from notes by Acting Assistant Surgeon C. H. Bullen.

In the twenty-five foregoing cases, the ligations were on the right side in thirteen, in twelve on the left. The patients were from nineteen to thirty-nine years of age, the average being twenty-five years. The interval between the reception of the injury to the date of ligation varied from one to two hundred and sixty days. The average was about twenty days in twenty-three cases, the two cases of traumatic aneurism in which the operation was done at a late date being abstracted. The operations were all for the results of gunshot injuries; in one case for primary hæmorrhage, and in two for intermediary hæmorrhage from the third portion of the subclavian; in eleven, for intermediary hæmorrhage from the axillary or its branches; in two cases, for secondary hæmorrhage from ulceration of the axillary, and in nine cases for false aneurism of the axillary. The intervals between the operation and the fatal termination in five of the unsuccessful cases were less than one day; in one of the fifteen remaining cases, death took place on the third day; in six, from the fifth to the eighth; in one, on the tenth; in five, from the twelfth to the fifteenth; in one, on the twentieth, and in one on the forty-sixth day. Twelve patients died from recurring hæmorrhage from the distal side of the ligated point; three died from pyæmia, and three from exhaustion from the preceding hæmorrhages; one from gangrene, and one from pleuritis. The assertion of Surgeon Selden that the latter is the most frequent cause of death in ligation of the subclavian, is not supported by these facts. The percentage of mortality is 80 per cent., or, including only the twenty-one cases of ligation outside of the scaleni, 76 per cent.†

* Becker, *On Gunshot Wounds*, Fiske Fund Prize Essay, 1864, p. 10.

† In Dr. George W. Norris's table (*Am. Jour. Med. Sci.*, N. S., Vol. X, p. 13, July, 1845), compiled with the conscientious care that characterizes all of his statistical contributions to surgery, sixty-nine cases of ligation of the subclavian for all causes are recorded, of which thirty-three, or 47.8 per cent., were fatal. Dr. Wilhelm Koch's exhaustive paper (*Ueber Unterbindungen und Aneurismen der Arteria subclavia*, Arch. f. d. kl. Chir., B. X, H. 1, S. 195, 280, Berlin, 1869) tabulates two hundred and twelve cases, and classifies them according to the indications for operation. Of seventy-three ligations for injury, forty-eight, or 65.7 per cent., were fatal. Professor Willard Parker's statistics (*Transactions Am. Med. Assoc.*, Vol. XVIII, p. 246) give one hundred and ninety-six ligations of the subclavian, with a mortality of 54.5 per cent. Of seventy of these operations performed for other causes than aneurism, the mortality was 68.5. At page 422, a case of ligation of the left subclavian in the third portion for gunshot wound of the neck is recorded, and in treating of *Wounds of the Upper Extremities*, in the second volume, I shall enumerate twenty-six additional cases, a total of fifty-two cases, with forty-one deaths, a mortality rate of 78.8, or nearly that reported in Circular No. 6, S. G. O., 1865, p. 78, from an analysis of thirty-five cases. Dr. Billroth, in his *Chirurgische Briefe*, 1870, S. 124, gives a most vivid and interesting account of five ligations of the subclavian in which he operated or assisted at Weissenburg and Mannheim. One patient was probably saved.

Ligations of the Internal Mammary Artery.—In referring, on page 523, to wounds of this vessel, four examples were cited in which pressure and styptics failed to control the bleeding. In the two following cases the ligature was equally ineffectual:

Case.—Private Ambrose Campbell, Co. A, 2d Pennsylvania Heavy Artillery, aged 21 years, was wounded near Petersburg, June 29th, 1864, by a conoidal ball, which entered the left side near the junction of the osseous with the cartilaginous portion of the second rib, and emerged near the sterno-costal articulation of the second rib on the opposite side of the chest, tearing away in its course the cartilage of the rib on the left side, producing an extensive comminuted fracture of the sternum and separating the cartilaginous attachment of the second rib on the right side of the chest. The cavity of the left pleura was laid open to the extent of two inches, and the corresponding lung wounded by a spicula of bone driven inward from the sternum at the time of injury. He was at once conveyed to the hospital of the 1st division, Ninth Corps, and thence transferred, on July 3d, and admitted into Carver Hospital, Washington, on July 5th. On admission, patient manifested symptoms of pleuro-pneumonia, accompanied with low muttering delirium with a tendency to sleep, with somewhat lucid intervals. There was involuntary discharge of urine ever after admission, as also of feces, with some two or three exceptions. Pulse not more frequent than in health, full, yet more hard; skin harsh and dry, yet not much above the natural temperature; respiration oppressed, but not labored. The cavity of left pleura was filled with a dark-brown fluid, which was occasionally removed by gently placing the patient in a prone position, allowing the fluid to escape through the orifice of the wound, but for four or five days prior to death it was partially removed by the use of a syringe. In the latter stage of the disease, fully four ounces of serum were effused into the cavity daily. These symptoms continued with little variation until July 13th, when profuse hæmorrhage occurred, probably from the internal mammary, which was ligated by Surgeon O. A. Judson, U. S. V.; there was not less than twelve ounces of blood lost, and the patient sank more rapidly, and died on July 19th, 1864. Autopsy showed the following: Condition of right lung, normal; left lung *in situ*, firmly bound down to wall of chest by recent adhesion; a lacerated wound of upper surface of upper lobe about two inches in extent, which was gangrenous; lower anterior portion of upper lobe gangrenous; this lobe was congested elsewhere, except at apex; lower lobe in a state of red hepatization; liver enlarged, pale, and of a nutmeg appearance; spleen enlarged, did not present its usual granular appearance. During life, the pulsations of the aorta and heart were exposed whenever the effused fluid was removed. The treatment of the case consisted, in the earlier stages, of moderate doses of quinine, with punch, castor oil, and cough mixture; in latter stages, diffusible stimulants and nourishing diet. *Specimen* No. 2925, Sect. I, Army Medical Museum, consists of the seventh cervical and first three dorsal vertebræ, with the corresponding ribs and part of the sternum. The second left rib was struck at its costal extremity by a bullet, which, passing transversely, tore away the cartilage, comminuted the sternum, and separated the cartilaginous attachment of the second right rib; the sternum is extensively necrosed, especially on its internal surface, the second portion of which shows traces of periosteal disturbance. The specimen and history were contributed by the operator.

As is well known, ligation of the internal mammary is esteemed of easy performance in the first three intercostal spaces, difficult in the fourth, very difficult in the fifth, almost impracticable in the sixth (Goyrand). I do not know that it has occurred to any one to adopt, in securing the internal mammary near the xiphoid appendix, Gérard's method for tying the intercostal, until the following operation was practiced by Surgeon R. B. Bontecou, U. S. V. One would suppose that the mammary, at the fifth intercostal space, would be too distant from the ensiform cartilage, to permit a mediate ligature of this sort to be placed effectually. The ligature did not control the bleeding in Dr. Bontecou's case:

Case.—Private John Gallin, Co. F, 65th New York Volunteers, aged 30 years, was wounded at Spottsylvania, Virginia, May 8th, 1864, by a conoidal ball, which entered the chest on the left side between the sixth and seventh ribs, five inches below the nipple, and emerged between the fifth and sixth ribs on the right side, four inches below the nipple, passing under the ensiform cartilage, wounding the internal mammary artery, and opening the right chest cavity and lower lobe of the lung on that side. He was conveyed to the hospital of the 1st division, Sixth Corps, and on the 14th was transferred to Harewood Hospital, Washington. On admission, the parts were in a very bad condition. The patient was anæmic and feeble from hæmorrhage. On the 19th, Surgeon R. B. Bontecou, U. S. V., administered sulphuric ether, enlarged the wound of entrance, and passed a piece of bandage through and tied it over the ensiform cartilage, ligating the internal mammary artery. Simple dressings and cold applications were applied, and supporting treatment administered. The patient gradually sank, and died May 24th, 1864, from recurring hæmorrhage and pneumonia of the right lung. The case is reported by the operator.

We are indebted to Goyrand for the best method of proceeding in ligation of the internal mammary.[1] "An incision two inches in length is to be made near the edge of the sternum obliquely from above downward and from without inward, forming with the

[1] It was first published in the *Lancette Française*, September 30th, 1834, and is quoted by Guthrie (*Commentaries*, p. 518) and others. It is gratifying to know that his nephew, Dr. Siebert, has lately published, in a collected form, the scattered memoirs of the surgeon of Aix, who attained in his provincial sphere, a celebrity scarcely second to that of any of the pupils of Dupuytren. In this volume, (*Clinique Chirurgicale*, du Docteur Goyrand (d'Aix), Paris, 1870, 8vo., pp. 588), the modest author states (p. 323) that he conceived and practiced this operation on the cadaver ten years before he printed an account of the manual procedure, and he details a highly interesting account of a sabre wound of the internal mammary.

axis of the body an angle of forty-five degrees. The middle part of this incision should be three or four lines distant from the margin of the sternum, and in the centre of the sternal extremity of the intercostal space. Dividing successively the skin, the cellulo-adipose subcutaneous tissue, and the great pectoral muscle, the intercostal space is exposed. An incision is then to be made in the same direction and over the entire width of the space of the aponeurotic layer which continues the external intercostal muscle and the superficial fasciculi of the internal intercostal. With a grooved director, the fibres of the latter muscle are to be separated and torn through, and the artery and its two venæ comites are laid bare at three lines from the edge of the sternum, which separates these fibres from the pleura. Then, nothing is easier than to isolate the artery and to slide beneath it the curved end of a grooved director or other suitable instrument for passing the thread." By following these directions strictly, the operator can scarcely miss the artery on the injected dead subject, and the operation is not difficult in the upper intercostal spaces on the living subject, except in those cases of gunshot fractures of the sternum, cartilages, and adjacent structures, in which the relations of the parts are disturbed. When there is an open wound and the adjacent soft tissues are swollen and infiltrated, and the vessel lacerated and displaced, the operation becomes very difficult. Then it is best to have recourse to the plan of Desault[1] and Zang[2] and to place over the wound a fine compress, four or five inches square, to press the centre of this through the wound, and to stuff the glove-finger or sac thus formed with lint; the angles of the compress are then put together, and the pad or ball of lint is drawn gently outward, and made to compress the wounded vessel against the sternum. To keep the pad in place, the compress may be tied like a purse, and the ligature secured around a roller or other convenient cylinder. Nélaton[3] advises that an air-compressor in the shape of a bag of rubber or gold-beaters' skin be introduced and insufflated within the chest.

Ligation of the Suprascapular Artery.—An instance in which this vessel was successfully tied, on account of intermediary hæmorrhage following a gunshot wound of the neck, is recorded on page 422. In the following case, the same sound practice of exposing the bleeding vessel and placing a ligature above and below the wound, was, if the brief notes are correctly interpreted, again adopted and rewarded by a successful issue:

Case.—Private Solomon Siekles, Co. H, 14th New Jersey Volunteers, aged 27 years, was wounded at Monocacy, Maryland, July 9th, 1864, by a conoidal ball, which penetrated the lung and fractured the scapula. He was received at General Hospital, Frederiek, Maryland, on the next day, and thence transferred to Jarvis Hospital, Baltimore, where he was admitted on July 25th. On August 1st, intermediary hæmorrhage occurred, probably from a diffused traumatic aneurism, and sixteen ounces of blood was lost; both ends of the posterior and superior scapular arteries were then ligated. There was no reeurrenee of the hæmorrhage and the patient was doing well when transferred to Philadelphia, September 11th, 1864. He was admitted to General Hospital, Beverly, New Jersey, September 13th, 1864, and thence transferred to Whitehall Hospital, Bristol, Pennsylvania, where he was admitted April 5th, 1865. He was discharged the service July 6th, 1865. The case is reported by Assistant Surgeon De Witt C. Peters, U. S. A. Examining Surgeon James B. Coleman, Trenton, New Jersey, reports, October 26th, 1868: "Musket ball entered the left side about two inches from the sternum, broke the upper surface of the clavicle, passed through the lower part of the neck, and came out through the upper edge of the scapula, carrying away more than an inch of the bone down to its spine; many fragments of bone were discharged from the wounds, front and back. The shoulder is much emaciated, weak, and muscles much contracted in their movements; the arm cannot be thrown from the side at a greater angle than ten degrees. The disqualification for manual labor is entire and permanent in that degree."

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[1] Desault, *Journal de Chirurgie*, Paris. 1771.

[2] Zang, C. B., *Darstellung blutiger heilkünstlerischer Operationen*, Wien, 1823, Theil I, S. 233.

[3] Nélaton, *Élém. de Path. Chir.*, T. III, p. 452. The instruments of this description designed for the treatment of epistaxis or the dilatation of the uterine canal are fragile and unreliable. The materials for Desault's tampon are always at hand, and the compress can be made strong and safe. If the attempt to ligate the vessel fails, this is the best resource. The hazard of exciting inflammation in the pleura and lung is less to be dreaded than the danger of hæmothorax. It is approved by Velpeau (*op. cit.*, T. II, p. 267).

Ligations of the Intercostal Artery.—Seven cases of gunshot wounds of this vessel have been reported, on page 526, *et seq.* In the eight following cases of the same nature, attempts were made to control the bleeding by ligature; but six of the eight cases resulted fatally. In the first, the old method of Gérard,[1] of including the rib, nerve, and veins in the ligature was adopted:

Case.—Private Smith Scofield, Co. D, 6th Connecticut Volunteers, aged 21 years, was wounded at Drury's Bluff, Virginia, May 14th, 1864, by a round ball, which entered the right side of the chest, just posterior to the angle of the ninth rib, passed anteriorly, fractured the ninth and tenth ribs, and emerged about three inches anterior to angle of tenth rib. He was treated in the field, and, on the 19th, sent to the hospital at Point Lookout, Maryland. On May 27th, profuse hæmorrhage from both wounds occurred, which was only controlled by cutting down and joining the wounds of entrance and exit in the track of the ball, and ligating the tenth intercostal artery by passing a ligature around both vessel and rib. The operation was performed by Assistant Surgeon William H. Gardner, U. S. A. Cold-water dressings were applied. The hæmorrhage did not recur. The patient was transferred, on September 3d, 1864, to Connecticut for muster out of service. Examining Surgeon G. B. Upham, of Yonkers, New York, July 8th, 1867, reports: "The wound of side consists in having portions of three ribs removed by a musket ball, leaving the right side much impaired so far as the action of the lung is concerned. The injury to the arm consists in having the upper portion of the right arm impaired from the effects of the same wound in the right side. The two wounds incapacitate the applicant one-half and permanently."

One great objection to the use of styptics in this class of wounds is the danger of their falling into the pleural cavity, and the employment of powdered substances would be especially exposed to this hazard. Probably the opening into the chest was obstructed, in Dr. Duer's case, by coagula or sloughs. At all events, the result was successful:

Case.—Private Reuben Morris, Co. K, 142d Pennsylvania Volunteers, aged 25 years, received a gunshot wound of the left side, between the tenth and eleventh ribs, at Fredericksburg, Virginia, December 12th, 1862. He was treated in the field and was transferred to Finley Hospital, Washington, on the 24th, and to Convalescent Hospital, Philadelphia, on January 11th, 1863. On January 20th, secondary hæmorrhage occurred from the intercostal artery to the amount of four ounces. Acting Assistant Surgeon Edward L. Duer, tied the artery at one extremity in the wound; the hæmorrhage did not recur. After the ligation the wound was filled with subnitrate of bismuth and a compress applied. This dressing was allowed to remain seventy-two hours, when the slough came away with the dressing and the sore presented a perfectly healthy appearance. He was discharged from service June 13th, 1863. The case is reported by Assistant Surgeon V. B. Hubbard, U. S. A. Examining Surgeon Charles Mace, of Scranton, Luzerne County, Pennsylvania, reported, June 22d, 1863: "Morris was wounded through his left side, fracturing two ribs. Disability one-half." He was last paid on March 3d, 1872.

In the next case, the attempt to tie the vessel was unsuccessful, though undertaken by Surgeon T. Antisell, U. S. V.:

Case.—Private Alfred McClay, Co. E, 114th Pennsylvania Volunteers, aged 17 years, was wounded at Fredericksburg, Virginia, December 13th, 1862, by a conoidal ball, which entered the right side at the costal cartilage, and emerged at the angle of the ninth rib, fracturing the rib between the point of entrance and exit. He was treated in the field, and, on December 17th, was sent to Harewood Hospital. When admitted, he suffered from traumatic pneumonia, which was treated by venesection and the administration of morphia and antimony. He recovered sufficiently to be able to move about the ward. The wound healed kindly. On January 11th, a profuse hæmorrhage occurred from the wound, probably from intercostal artery, which continued in spite of compression. An unsuccessful attempt was made to ligate the artery. The hæmorrhage was finally suppressed, after an alarming loss of blood, by tight bandaging and styptics. The stoppage of the hæmorrhage was immediately followed by pain on both sides, cough, and expectoration. Pyæmia set in, and death occurred on January 24th, 1863. Necropsy: No opening had been made into the cavities, either by the missile or ulceration. Eight abscesses, from the size of a pea to that of an orange, were found in the lower lobe of the left lung, which was also in a very congested condition.

Case.—Private *J. B. Bruce*, Co. C, 31st Alabama Regiment, aged 17 years, was wounded in the chest by a minié ball and taken prisoner at the battle of Shiloh, April 6th, 1862. Assistant Surgeon B. Howard, U. S. A., in a report of the case published in *The American Medical Times*, Vol. VI, page 52, says: "My attention was specially called to his case the second day out from Pittsburg Landing by my friend Dr. Bush, sr., of Lexington, Kentucky, because, of the many cases of wounds of the chest on board the transport, this was one of the very few in which the ball had lodged. The patient had a rather favorable appearance, and the wound looked well, with no tendency to hæmorrhage. April 17th, patient was admitted to General Hospital, Louisville, Kentucky, with gunshot wound of the chest, fracturing the ninth rib about three inches to the left of the spinal column. The usual symptoms of gunshot wound of the lung which were present gradually disappeared; the hectic which ensued had ceased, and the patient, though very weak, was convalescing with remarkable rapidity; medication had been discontinued, the only remaining treatment consisting in the use of simple dressing and bandage to the healing wound. April 29th: Calling accidentally at the hospital at about one o'clock P. M., I was informed an orderly had been dispatched to request me to visit the patient immediately. Secondary hæmorrhage had suddenly occurred, the bed was already saturated with blood, and the patient almost in a state of syncope. A medical officer had been trying in vain to stop the bleeding for about half an hour, and when I

[1] Gérard, in Dionis, *Cours d'Operations de Chirurgie*, éd. La Faye, Paris, 1771, p. 341.

entered was controlling it by pressure on the wound. I slightly enlarged the wound, and discovering with my little finger a good many small fragments of comminuted bone, carefully removed some of them with dressing forceps. Meanwhile, the arterial jet was becoming stronger and the patient momentarily weaker. There was evidently no time to be lost. Pressure at the wound was quickly supplied and steadily kept up. Stimulus was administered, and the patient being placed upon the table was put under chloroform. An incision was then made on the proximal side of the wound about an inch and a half in length, beginning about half an inch to the right of the margin of the wound and extending along the middle of the posterior surface of the ninth rib, the middle of the incision being about an inch and a quarter from the wound in order that spicula of bone might not interfere with the subsequent steps of the operation. Having laid bare that part of the rib and carefully defined its superior margin, I took the blunt-pointed strongly-curved needle belonging to the chain saw, armed it with a well-waxed ligature, and introduced it, passing it immediately over the superior margin of the rib at the middle of the incision. The lips of the incised wound were well retracted, so that the eye of the needle could be sufficiently depressed to maintain the contact of its blunt point with the inner surface of the rib until it emerged at its inferior margin opposite the point of entrance. The ligature was then tied, including both the rib and artery. The bleeding stopped instantly. In order to make the success secure, I repeated the operation in the same manner at the distal side of the gunshot wound. The soft parts were then brought together and secured by sutures and adhesive straps. The patient rallied from the effects of the chloroform, conversed rationally, but sank from exhaustion and died about three o'clock P. M. The autopsy relieved me of the chief objection which appeared to present itself to the operation, for after careful examination it was found that in the case of both ligatures *the pleura costalis was not pierced*. When the usual means had failed, a tedious attempt was made in a case that came under my observation to secure the bleeding ends of the artery, but without success. In such a proceeding there must be great danger either of creating an opening, or of enlarging one already made into the cavity of the chest. The operation with the needle as described above, has the following advantages where ordinary means have failed: The bleeding is stopped from the first moment of seeing the patient, as it can always be controlled by pressure at the wound until the operation is completed. Pneumothorax need not be apprehended, as the pleural cavity is not penetrated, and even though it were, the operation being subcutaneous, would not be likely to cause it. A silver wire ligature, which it would be better to use, would not produce pleuritis of a serious character even though the pleura were pierced; the ligature could be twisted as tightly as necessary without danger of breaking and be withdrawn at pleasure. From the relation of the artery to the rib, more certain success might be anticipated from this operation anterior to the angle of the rib. In the case given above, after all other means had been tried in vain, the success of the operation was instant and complete, and but for the previous loss of blood would probably have saved the life of the patient."

CASE.—Private Patrick F. W———, Co. A, 33d Ohio Volunteers, received a penetrating gunshot wound of the chest at Chickamauga, Georgia, September 20th, 1863; the missile entered four inches below the right axilla, passed backward, and emerged at the lower angle of the scapula. He was taken prisoner and remained in the hands of the enemy until September 30th, when he was paroled and sent to the hospital at Chattanooga, Tennessee. Hæmorrhage occurred several times during the night of October 4th; an examination on the next day showed the skin to be swollen with an accumulation of blood; the patient was exceedingly feeble and almost deadly pale. Surgeon I. Moses, U. S. V., administered ether, dilated the wound, turned out all the clots, and, after some difficulty, succeeding in ligating the intercostal artery. Some spiculæ were removed, but it was not deemed safe to continue the use of the anæsthetic longer and the patient was aroused. No further hæmorrhage occurred and he promised admirably, but about the end of the month he began to fail, and died of empyema of the same side. Necropsy: The lung had been wounded and adhered closely to the edges of the wound. The lower part of the pleura contained dark unhealthy pus, while the upper part was filled with an inflammatory secretion. The pathological specimen showing the lower third of the right scapula and the adjoining portions of the seventh, eighth, ninth, and tenth ribs, is represented in the wood-cut (FIG. 252). The extremity of the scapula is carried away, the tenth rib comminuted, and the ninth contused. The fractured extremities are necrosed. The thoracic surfaces show free deposits of osseous matter, which agglutinate them. It was contributed, with a history of the case, by the operator.

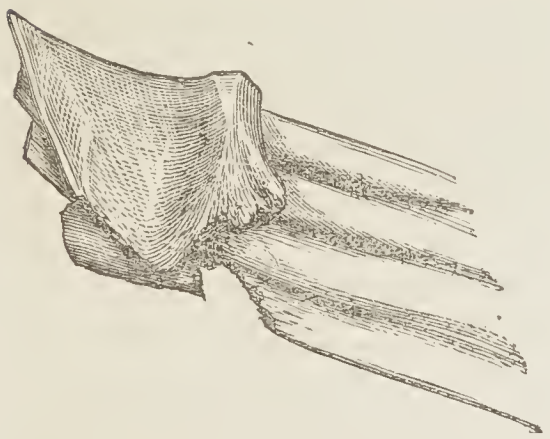

FIG. 252.—Portions of right scapula and ribs, showing gunshot fractures of exit. *Spec.* 2124, Sect. I, A. M. M.

CASE.—Private James Mahew, Co. D, 100th Pennsylvania Volunteers, was wounded at the battle of North Anna River, Virginia, May 24th, 1864, by a conoidal musket ball, which entered the left side and fractured the twelfth rib. He was received into the field hospital of the 1st division, Ninth Corps. Spiculæ of bone were removed and an intercostal artery was ligated. Death supervened two days after the reception of the injury. The case is reported by Surgeon M. K. Hogan, U. S. V.

CASE.—Private J. H. Butterfield, Co. F, 3d Vermont Volunteers, aged 26 years, was wounded at Lee's Mills, Virginia, April 16th, 1862; the ball entered the integuments at the seventh rib, a little posterior to the nipple, and emerged six inches posteriorly, fracturing in its course the eighth and ninth ribs. He was treated in the field until the 20th, when he was transferred to Hygeia Hospital, Old Point Comfort, Virginia. When admitted the patient was suffering from chills, followed by profuse perspiration. April 25th, considerable hæmorrhage occurred from the intercostal artery. Surgeon R. B. Bontecou, U. S. V., operated by uniting the wounds of entrance and exit by incision, and cutting off the fractured ends of the ribs with the bone forceps, leaving the periosteum and vessel untouched. The intercostal artery was picked up by the tenaculum and ligated. The pleural cavity did not seem to have been opened by the ball, but the motion of the cut end of the rib wore an opening and also divided the artery, and hæmorrhage again occurred. Two days after, the vessel was again tied and the rib cut off still further. Only supporting treatment was used, together with quinine. The patient continued to sink, and died May 4th, 1862, from exhaustion.

CASE.—Private Thomas Adams, Co. C, 7th Wisconsin Volunteers, aged 18 years, was wounded at the battle of the Wilderness, Virginia, May 10th, 1864, by a conoidal musket ball, which passed through the left arm and lodged in the lung. He reached Alexandria, Virginia, several days after being wounded, and was admitted to the 2d division hospital. Hæmorrhage occurred from an intercostal artery on May 18th, and again on the following day. For this compression was resorted to, and an unsuccessful attempt at ligation was made by Surgeon T. Rush Spencer, U. S. V., at the entrance wound in the chest, about three inches in front of the angle of the sixth rib. The fifth intercostal space was found very narrow at this point, the wound in the pleura very deep, and the obstacles to tying the vessel were insurmountable. Compression by plugging the wound and closing the orifice as nearly as practicable. Sixteen ounces of blood were lost on the occasion of the third bleeding. Death resulted on May 19th, 1864. At the autopsy, the left pleural cavity was found to contain much blood. The ball was lodged in the lower lobe of the lung of that side.

Of these eight cases of operations on the intercostal, three were for secondary and four for intermediary hæmorrhage, and one for primary bleeding after gunshot wounds. Six cases were fatal; one from pyæmia, one from empyema, one failed to react, and three had recurrent hæmorrhage. The operations had scarcely more satisfactory results than the cases treated by compression. Desault's excellent means of compression by the compress stuffed with lint does not appear to have been employed in any of the fifteen cases. It merits a trial whenever a ligature cannot be made satisfactorily, and without tying in the rib. If the pleura and lung are intact, the risk of wounding these organs is avoided, and if they are already wounded, it is the least irritating dressing that can be employed. There is no danger of losing the little pad within the pleural cavity, as has happened in plugging the wound with sponge or charpie; and it can be further said in favor of this method that it has proved successful in a considerable number of cases (Bégin, Velpeau, Jamain) in controlling the hæmorrhage without exciting inflammation in the lung or pleura. The authorities cited in the foot-note discuss many other plans of dealing with this troublesome form of hæmorrhage. Some of them are dangerous, others trivial, and others again more ingenious than useful.*

*GÉRARD (note by LA FAYE in his edition of the *Cours* d'Operations of DIONIS, 1740, p. 425) first proposed to control bleeding from the intercostal artery by passing a ligature around the rib and interposing a pledget of lint between the ligature and the inner surface of the rib. He inserted the thread at the wound with a sharp curved needle and brought it out through the intercostal space above. GOULARD, of Montpelier (*Mém. de l'Acad. des Sciences*, 1740), and GARENGEOT (*Traité des Operations de Chirurgie*, Pézenas, 1777, T. II, p. 430), endeavored to avoid a second wound, by employing a blunt needle, with the eye near the extremity, and a very abrupt curve, and, by keeping close to the rib, to bring the thread out at the first opening. LEBER (in PLENCK, *Samlung von Beobachtungen*, B. II, S. 210) passed a riband by a flat flexible probe through a new opening made in the intercostal space above. STEIDELE (*Abhandlung von den Blutflüssen*, Wien, 1776, S. 77) proposed to substitute a silver probe curved in S, and BÖTTCHER (*Auch eine Compressions-methode f. d. Arteria intercostalis*, in dessen *Abhandlung v. d. Krankheiten der Knochen*, Leipsig, 1795, S. 233) proposed a bent bulbous steel probe with an eyelet. Reich (VELPEAU, *Nouv. Élém. de Méd., Op.* T. II, p. 265) advised that both ends of the ligature should be passed through a piece of gum catheter before knotting. If, with the aid of these suggestions, the operator succeeds in ligating the intercostal with the rib, he may contemplate with Sabatier (*De la Médecine Opératoire*, éd. de Sanson et Bégin, 1822, T. II) the dangers of puncturing the pleura, of necrosis from denudation of the rib, and of the pledget or tent falling into the pleural cavity. The plans for tying the artery above, or the artery, vein, and nerve together are also numerous. REYBARD (*Mém. Sur le Traitement des Plaies Pénétrantes de la Poitrine*, Paris, 1827, p. 860) and NEVERMANN (*Ueber das beste Verfahren, eine Hæmorrhagie der Art. intercostalis nach Verwundungen zu stillen*, in Berliner Med. Centralzeitung, Aug. 6, 1856) propose to use staphyloraphic or other jointed needles to pass the thread; GROSSHEIM (*V. Graefe und V. Walther's Jour.*) recommends Arendt's aneurism needle, which CHELIUS (*Ueber das Verletzung der arteria intercostalis in gerichtlich Medicinischer Hinsicht* in Heidelb. Klin. Annalen B. III, H. 2) condemns. B. BELL (*A System of Surgery*, 7th ed., 1804, Vol. I, p. 258) insists that in thin people, it is always practicable to expose the vessel and to take it up with a sharply curved tenaculum. This failing, he would resort to Leber's plan. ASSALINI (*Manuale di Chirurgia*, p. 57) advises that the artery be cut across and allowed to retract, and THEDEN (*Wiltd. verwundete Arteria intercostalis ganz durchschneiden und zurückschieben*; dessen neue Bemerk. und Erfahr. Th. I, Berlin, 1782, S. 59) contends that bleeding may always be stanched by completing the division of the artery, turning back its posterior extremity, and plugging the wound. GUTHRIE (*Commentaries, l. c.* p. 519) met with no difficulty in using torsion in one case, and the ordinary ligature in another. BILGUER (*Pract. Anweizung für Feldwundärzte*, Berlin, 1783, S. 118) and RICHTER (*Chirurgische Bibliothek*, Gottingen, B. IV, S. 695) applauded the plan of tying a stout thread about the middle of a tent, introducing the latter horizontally through the wound, which is enlarged if necessary, then placing the tent vertically and drawing upon the cord, thus compressing the artery, and the edges of the two adjacent ribs as well, as Velpeau remarks. LOTTERI, of Turin (*Histoire de l'Académie royale de Chirurgie*, p. XCV, appended to the second volume of the Memoirs of the Academy, 4°, Paris, 1753), invented a steel plate, with a pad and perforations at the ends for passing a riband, and proposed to introduce this instrument within the chest to make direct compression on the artery. QUESNAY (in Sabatier, *l. c.*, p. 84) substituted an ivory whist-marker, with a dossil of lint for a pad, and perforations for a tape to keep the instrument in place. BELLOQ (*Mem. de l'Acad. de Chir.* T. II, p. 121, Plate IV) found all their plans defective and invented a complicated tourniquet or vice with steel convex disks, between which the rib and its vessels were to be compressed. The employment of these machines involved the necessity of a very large wound in the chest. Digital compression by relays of assistants has found its advocates (according to VELPEAU, *l. c.*, p. 266). LOEFFLER (*Blutstillung aus d. Arteria intercostalis*, in Blumenbach's Med. Bibliöthek, B. III, S. 511, Göttingen, 1794) teaches that the intercostal space should be opened and the artery tied posteriorly to the wound, leaving the latter open for the discharge of blood and secretions. Professor GROSS (*Op. cit.*, 5th ed., Vol. II, p. 444) proposes to drill a small aperture into the rib, immediately above the artery, and to pass a silver wire around its bleeding orifice. CHELIUS (*South's Translation*, Am. ed., *l. c.*, T. I, p. 492) well observes that bleeding from the intercostal artery is often observed by the military surgeon in connection with laceration of the lung, and that most of the methods above mentioned increase the bleeding from that organ. When the intercostal artery is wounded between the sternum and angles of the ribs, where the majority, perhaps, of wounds of the chest occur, the vessel does not always bleed freely; but posteriorly a wound almost invariably causes profuse bleeding, and here the vessel is secured with much difficulty on account of its depth.—ED.

Ligations of the Axillary Artery.—Besides the large number of ligations of the axillary after wounds of the arm, which will be detailed hereafter, there were thirteen cases in which this vessel was tied for hæmorrhage attending gunshot wounds of the chest. The result was unsuccessful in every instance The patients were from eighteen to twenty-five years of age, the average being twenty-one. The operation was on the right side in five, on the left in eight instances. It was performed for early bleeding, from wounds of the axillary or brachial in three cases; in ten, for intermediary hæmorrhage, occurring from the tenth to the eighteenth day after the reception of the injury. Three of the patients died on the day of the operation, the others from the third to the thirteenth day. In the first case the operation was performed for primary bleeding from the brachial:

Case 1.—Private James Leddie, Co. E, 118th New York Volunteers, was wounded at Petersburg, Virginia, June 30th, 1864, by a musket ball, which entered the upper third of the left arm, passed behind the bone, wounding the brachial artery, and emerged two inches below the middle of the clavicle. He was conveyed to the hospital of the 1st division, Eighteenth Corps, where the left axillary artery was ligated in the axilla on account of persistent hæmorrhage on July 1st. Patient pale, arm cold, forearm almost pulseless. Sensation absent from hand and part of forearm. Death resulted on July 2d, 1864. The case was reported by the operator, Surgeon T. H. Squire, 89th New York Volunteers.

Case 2.—Private Michael Foley, Co. K, 11th Illinois Cavalry, aged 20 years, a robust and healthy man, was wounded near Vicksburg, Mississippi, March 3d, 1864; the ball struck near the margin of the pectoral, passed backward, inward, and upward, and lodged in the muscles of the back, between the scapula and spinal column; the axillary artery was severed in its lower third. He fainted from loss of blood, when wounded. On the 5th, he was conveyed to Hospital No. 2, Vicksburg. When admitted, there was some fever; pulse 90, full and moderately strong. Skin, secretions, and appetite in tolerably good condition. The wound was painful, but he had slept some, was cheerful, and did not suppose himself dangerously wounded. The arm was considerably swollen; extensive ecchymosis of arm and chest; no hæmorrhage; wound healthy; suppuration commencing. No pulsation below the wound; arm, forearm, and hand warm. Collateral circulation good. Assistant Surgeon W. B. Trull, U. S. V., administered chloroform, enlarged the wound, and ligated the proximal end of the axillary artery in the wound three-fourths of an inch above the injury. Very little hæmorrhage occurred. The patient reacted finely. On the 7th, the ball was cut down upon and removed. He did well until the 9th, when the ligature separated, and intermediary hæmorrhage came on to the amount of thirty-two ounces. The arm was considerably swollen but the wound was not unhealthy. The patient was feeble, pale, and anxious; pulse rapid and weak. Chloroform was again administered, and the artery religated half an inch higher up in the wound. He gradually sank, and died on March 10th, 1864, from exhaustion, the axillary artery having sloughed after the first ligation. The *post-mortem* examination revealed nothing additional except the precise points of the ligations of the artery. The second ligation was one-third of an inch above the external circumflex artery. The case is reported by Surgeon Edward L. Hill, 20th Ohio Volunteers.

Case 3.—Corporal Alfred Hollingshead, Co. H, 12th Kentucky Volunteers, was wounded at Marietta, Georgia, June 21st, 1864, by a pistol ball, which entered at the upper third of the right arm, passed inward to the chest, and emerged at the third dorsal vertebra. He was taken to the field hospital of the Twenty-third Corps. On June 23d, paralysis of motion and sensation in the arm ensued. Surgeon Edward Shippen, U. S. V., enlarged the wound and ligated the axillary artery; the brachial artery was also ligated below the wound. Mortification supervened in the course of forty-eight hours, and death resulted on June 26th, 1864. The case is reported by Surgeon A. M. Wilder, U. S. V.

Case 4.—Private William Hall, Co. H, 15th United States Infantry, aged 19 years, while lying in his tent at Mobile, Alabama, January 11th, 1866, was wounded by the accidental discharge of a musket in the hands of a comrade. The ball entered the right side just below the cartilages of the false ribs, fracturing in its passage the eighth rib; it then emerged, and entering the axilla, traversed the arm, and passed out posteriorly at the top of the shoulder. The humerus was not injured. He was taken to the post hospital at Mobile. Before admission he was said to have lost a bucketful of blood. When admitted he was in a state of syncope, was unable to speak, and almost pulseless. The extremities were cold. Powerful stimulants were immediately administered. Very slight hæmorrhage occurred from either wound. He continued to improve steadily until the morning of the 20th, when he was attacked with profuse hæmorrhage, which came from the neighborhood of the axillary artery. He lost about fifteen ounces of blood. The usual compression was applied and the hæmorrhage ceased. On the morning of the 21st, a second hæmorrhage occurred, by which he lost about twenty ounces of blood. On the 22d, the prostration was so extreme and the prospects of controlling the continued oozing so remote, that a consultation was held, and it was determined to put him under the influence of chloroform and tie the artery. A very small quantity of the vapor sufficed, and after a great deal of difficulty, owing to the great swelling and purulent matter in the wound, the artery was tied with a single ligature by Acting Assistant Surgeon R. W. Coale. During the operation several pieces of cloth were extracted, and also two pieces of substance which had the appearance of portions of an artery and which subsequently proved to be such. On the extraction of the cloth, hæmorrhage *per saltum* commenced, which, however, was easily controlled by pressure on the subclavian above the clavicle by means of a door-key. The patient only survived the

Fig. 253.—Portion of right axillary artery, its coats ulcerated through, after gunshot contusion. *Spec.* 2674, Sect. I, A. M. M

operation a few minutes. Necropsy: A large semi-circular portion of the axillary artery, corresponding to about half the calibre of the vessel, was clearly cut out by the ball, about an inch below where it is called the subclavian. The bone and brachial plexus were uninjured. The lower dissection showed the fractured rib, with suppurating soft parts, corresponding to the course of the ball. The most important fact connected with the case was the great length of time before intermediary hæmorrhage took place—nine days. There is no doubt that the cloth was driven into the artery, and, possibly, by some movement of the patient afterward, or from suppuration of surrounding tissues, this and the coagula were dislodged. Almost invariably such a wound in an artery of this calibre would cause death in less than five minutes. The wood-cut (FIG. 253) on the preceding page represents a preparation of the axillary artery. It was contributed, with a history of the case, by Assistant Surgeon H. J. Phillips, U. S. A.

CASE 5.—Private John W. Hills, Co. A, 145th Pennsylvania Volunteers, aged 24 years, was wounded at Fredericksburg, Virginia, December 13th, 1862; the ball entered the integuments at the middle third, external edge of the scapula, passed through the axilla, and lodged in front, just below the insertion of the pectoralis minor. He was carried to the field hospital, where the ball was removed a few hours after the reception of the injury. Simple dressings were applied. On the 17th, he was transferred to Harewood Hospital, Washington. The case progressed well until the 23d, when hæmorrhage to the amount of about six ounces occurred from the posterior wound. The wound was enlarged and the bleeding vessel searched for, but it could not be found, although it was supposed to be the suprascapular artery, as pressure below the clavicle arrested the hæmorrhage. The edge of the scapula was denuded and rough for about one inch. The axillary artery was ligated immediately after its emergence from beneath the clavicle and the incision brought together by adhesive strips. December 24th: Some febrile disturbance. A diaphoretic was administered, and milk diet ordered. 25th: Nervous delirium; stimulants, with morphia, beef tea and chicken diet. 26th: The delirium has subsided. On the 27th, he refused to take the stimulants and morphia, and the delirium returned. It was with the greatest difficulty that nourishment could be administered to him, as he closed his teeth and rejected everything. He continued in this condition until the 29th, when a capillary hæmorrhage occurred to the amount of about one ounce from the posterior wound. Compress and bandage were applied, which entirely arrested it. He would occasionally take a spoonful of milk punch with a small quantity of morphia in it. Death resulted on the night of December 29th, 1862. The ligatures had not come away. The wound of incision had suppurated freely but there was no attempt at union. Surgeon Thomas Antisell, U. S. V., reports the case.

CASE 6.—Sergeant John Mackey, Co. I, 50th Pennsylvania Volunteers, aged 23 years, was admitted to Mount Pleasant Hospital, Washington, May 29th, 1864, with a gunshot wound received at Cold Harbor, Virginia, on the 25th. The ball entered at the anterior aspect of left arm and made its exit at posterior and inferior border of scapula; the axillary artery was divided about where it becomes the brachial. June 5th: Arm and forearm immensely swollen from erysipelas and extravasation, and in a sloughing condition. The patient was nearly exhausted from excessive hæmorrhage from the axillary artery. Acting Assistant Surgeon H. Craft attempted to ligate the axillary artery. An incision of three inches was made along the border of the dorsal muscles, and the artery exposed. While in the act of taking it up the patient died. The case is reported by Assistant Surgeon C. A. McCall, U. S. A.

CASE 7.—Private John Moser, Co. B, 51st Illinois Volunteers, aged 18 years, was wounded at Franklin, Tennessee, November 30th, 1864. A minié ball entered over the anterior border of the right scapula, fractured the bone, passed downward, and emerged at lower angle of scapula. He was admitted on the next day to Hospital No. 3, Nashville. Tonics and nourishing diet were administered. On December 12th, intermediary hæmorrhage occurred from enlarged vessels of the collateral circulation; pressure was applied and the bleeding arrested until the 14th, when it again occurred. A ligature was now successfully applied to the axillary artery under the border of the pectoralis minor muscle. This arrested the bleeding until the 19th, when profuse hæmorrhage occurred from the incision. The wound was plugged with lint saturated with tincture of iron and pressure was applied. The hæmorrhage did not recur, but the patient failed to recuperate, and died December 21st, 1864, from exhaustion. The case is reported by Surgeon J. R. Ludlow, U. S. V.

CASE 8.—Private Asahel A——, Co. F, 25th Massachusetts Volunteers, aged 25 years, was wounded at Cold Harbor, Virginia, June 3d, 1864; a conoidal ball entered the left axilla and lodged at the posterior border of the scapula. He was taken to the field hospital of the 2d division, Eighteenth Corps, where the ball was removed and simple dressings were applied. On June 11th, he was transferred to Lincoln Hospital, Washington. On the 15th, intermediary hæmorrhage to the amount of about twenty ounces occurred, probably from some branch of the axillary artery. The wound was dilated and a small artery, probably one cut in dilating the wound, ligated. The wound was filled with lint saturated in a solution of persulphate of iron, and a compress applied. The axillary artery could be distinctly felt with the finger, pulsating in the wound. Pulse regular, but weak; patient looked pale. Anodynes and stimulants were administered. On the next day hæmorrhage again occurred, which yielded to strong pressure on the compress. June 17th, 10 A. M.: Patient very pale, anæmic, and suffering from much pain in the arms and shoulder. The compress and plugging were removed, when the blood gushed out alarmingly. The wound was freely dilated and the axillary artery ligated The hæmorrhage stopped and at the same time the heart ceased to beat. The necropsy showed the axillary largely opened about the middle of its course, on the side next to the track of the ball. There had evidently been sloughing through nearly the whole calibre of the artery. The adjacent wood-cut (FIG. 254) represents a preparation of the left axillary artery, with a large and deep ulceration, involving nearly half of the cylinder of the vessel, about an inch above the origin of the subscapularis. It was contributed, with a history of the case, by Acting Assistant Surgeon W. L. Herriman.

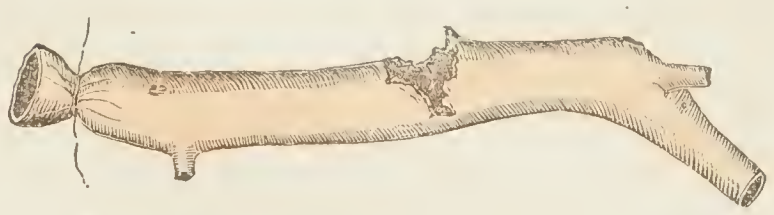

FIG. 254.—Portion of a left axillary artery, showing an ulceration after ligation. *Spec.* 2576, Sect. I, A. M. M.

Case 9.—Private James T. Shepherd, Co. A, 18th Massachusetts Volunteers, aged 18 years, of a naturally strong and vigorous constitution, was wounded at Gettysburg, Pennsylvania, July 2d, 1863; the ball entered at the inner edge of the deltoid of the left side, at the curve of the armpit, passed through the axillary space, and emerged three inches below on the outer side of the arm; a great quantity of blood was lost at the time of the injury. He was treated in the field until the 8th, when he was transferred to Satterlee Hospital, Philadelphia. The patient was kept as quiet as possible, and cold water applied to the wound. On the 14th, arterial hæmorrhage took place, when about a pint of blood was lost. The wound was immediately cut down upon, and the bleeding vessel, supposed to be the axillary artery, was tied. On the 19th, hæmorrhage to the amount of about eighteen ounces occurred; the wound was again opened and the vessel secured higher up. On the 23d, hæmorrhage recurred again, and the vessel was ligated still higher up. It was only after the third ligation that the pulsation at the wrist was stopped; during the intervals of the hæmorrhage he was kept up with beef tea, brandy, milk, etc. After the third hæmorrhage he was excessively exhausted, and it seemed as if he would hardly rally. A fourth hæmorrhage, on July 24th, caused death. The case is reported by Acting Assistant Surgeon T. G. Morton.

Case 10.—Private David Walsh, Co. D, 106th New York Volunteers, aged 23 years, was admitted to Filbert Street Hospital, October 24th, 1864, with a gunshot wound of the left shoulder, received at Cedar Creek, Virginia, on the 19th. November 3d: Vessels and tissues much matted together. The patient's constitutional condition, which was good primarily, was greatly reduced by hæmorrhage. Acting Assistant Surgeon Edward L. Duer administered chloroform and ether, and ligated the left axillary artery immediately under the clavicle, in the triangle formed by the pectoralis minor muscle, thorax, and clavicle. Under the free use of cream, butter, and wines the progress of the case was very encouraging, but hæmorrhage recurred on November 15th; death resulted on the same day. Surgeon Thomas B. Reed, U. S. V., reports the case.

Case 11.—Private Charles Tighe, Co. F, 56th Massachusetts Volunteers, aged 18 years, received a gunshot wound of the left chest and arm at Petersburg, Virginia, June 16th, 1864. The ball entered at the middle of the pectoralis major of right side, passed through the left axilla, and emerged at the upper third of the arm, outer aspect, wounding the axillary artery. He was at once admitted to the hospital of the 1st division, Ninth Corps, where simple dressings were applied to the wound. On the 19th, he was transferred to Harewood Hospital, Washington. On July 1st, intermediary hæmorrhage to the amount of twelve ounces occurred, and on the next day Surgeon R. B. Bontecou, U. S. V., ligated the axillary artery. The hæmorrhage did not recur, but the patient died July 4th, 1864, from exhaustion. The case is reported by the operator.

Case 12.—Private William E. Downing, Co. I, 16th Pennsylvania Cavalry, aged 19 years, wounded at Hanover, Virginia, on May 28th, 1864, by a conoidal ball, which passed through the left axillary space. He was conveyed to the field hospital of the 2d division, Cavalry Corps, where the wound was dressed. On June 4th, he was transferred to De Camp Hospital, New York Harbor. On the 12th, intermediary hæmorrhage to the amount of twenty ounces occurred from the axillary artery. On the 15th, the patient was put under the influence of chloroform and the axillary artery was ligated above and below the wound. The vein was found injured, and was also ligated. The hæmorrhage did not recur. Death ensued on June 28th, 1864. Assistant Surgeon Warren Webster, U. S. A., reports the case. There was no evidence at the *post mortem* examination of the phlebitis or of pyæmia.

Case 13.—Private E. C. Melley, Co. K, 2d West Virginia Mounted Infantry, was wounded at Droop Mountain, Virginia, November 6th, 1863, by a musket ball, which entered one and one-fourth inches below the junction of the inner and middle thirds of the clavicle, passed downward and backward, and made its exit about midway of the inferior costa of the scapula, one-half an inch from its edge. He was conveyed to Beverly, and admitted, on the 12th, to the post hospital. Simple dressings were applied to the wound. On the 18th, he was transferred to Grafton, a distance of forty-six miles. When admitted, an enormous tumor of coagulum occupied the axilla, burrowing under and between the pectoral muscles as well as the scapula and latissimus dorsi, filling up the space below the clavicle, and rendering all the tissues tense. The superficial veins were enlarged. The patient had lost considerable blood while being removed from Beverly. He passed the night tolerably well. Pulse quite full at *both* wrists. The hæmorrhage proceeded from the anterior orifice; the posterior one was closed and nearly healed. On November 19th, Surgeon S. N. Sherman, U. S. V., administered chloroform and ligated the axillary artery over the second rib. An incision was made along the junction of the sternal and clavicular portion of the pectoral muscle, and the clot turned out, when a sudden and tremendous gush of blood took place, which was promptly arrested by compression above the clavicle. The clavicular portion of the muscle was partly divided at right angles to the first incision. The depth of the wound was considerable, rendered so by the swollen condition of the parts; the tissues were greatly disorganized. Pulsation of the artery was arrested by compression above the clavicle. In searching for the artery the subclavian vein was opened, the entrance of air caused syncope, and death ensued in from seven to ten minutes. The necropsy revealed the axillary artery almost entirely divided about one inch before it becomes the brachial. The case is reported by the operator.

Of the thirteen foregoing operations for ligation of the axillary, there were four of what is called diffused aneurism; which, as Professor Gross remarks, is not an aneurism at all. Yet in these cases the compression exercised by the effused blood and, in two of them at least, injury of the brachial plexus and axillary vein, had so seriously interrupted the circulation of the arm, that it is highly probable that amputation at the shoulder-joint, or the "old operation," might have given less disastrous results, or at least would have been more correct practice. Of Case 3, Surgeon C. S. Frink remarks:

"The patient was not in a favorable condition. The arm was cold, and perfectly paralyzed; at one time there was a slight movement of the fingers possible, but this was soon gone, and although

there was no direct injury of the axillary plexus, sensation and motion were not restored after the artery was ligated, owing to the fact, as I think, of the collateral circulation being impeded by the pressure of the aneurism, prior to the operation, and there not being sufficient vigor in the system to restore it afterward."—(*Medical Director* H. S. HEWIT'S *Report, p.* 81.)

In one of these four cases, the promptly fatal issue was referred to entrance of air into the subclavian vein. In one, gangrene appeared, and two were fatal from anæmic exhaustion before mortification set in. Of the nine remaining cases, six, in which single ligatures had been placed on the cardiac side of the wound, died of recurrent distal hæmorrhage;* two were so exhausted that they died during the operation; while Dr. Webster's patient (CASE 12) lived till the thirteenth day, and appears to have succumbed to the prostration consequent on the bleeding prior to the operation. In this case and Dr. Shippen's (CASE 3) alone of the thirteen, was the artery tied below as well as above the wound. In ten of the thirteen cases, the missile injured the axillary artery; in three, bleeding was thought to proceed from the thoracic, scapular, or circumflex branches. That pressure below the clavicle should arrest hæmorrhage from the suprascapular (CASE 5) was singular, to say the least, and led to practice, which, unless the bleeding in CASE 7 came from another branch of the subclavian, the posterior scapular, is believed to be unparalleled. Though one or two of the operations may be regarded almost as ligations of the subclavian toward the end of its third portion, the error of tying that vessel above the clavicle for wound of the axillary (*see* GUTHRIE, Lect. XII, p. 200) was not committed in any of the cases of this lamentable series.

Ligations of Branches of the Axillary.—In wounds of the chest complicated by bleeding in the axilla, after the main trunk, the subscapular was the vessel most commonly injured. But no instance appears of ligation of this trunk in the continuity for wounds or for wounds of its branches, though it was not infrequently tied in operations for amputation. The Museum affords a specimen, represented in the wood-cut (FIG. 255), of a gunshot wound of this vessel, resulting in sloughing and fatal secendary hæmorrhage:

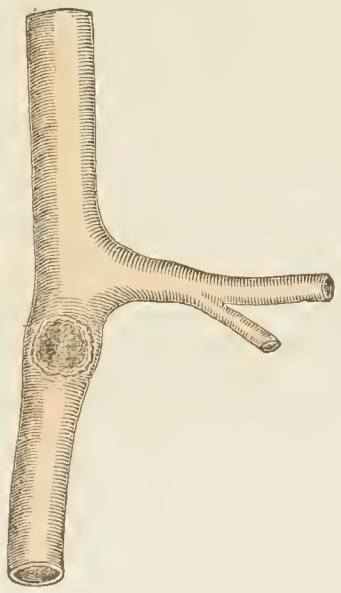

FIG. 255.—Portions of left axillary and brachial, showing the sloughing off of the subscapular at its origin. *Spec.* 2835, Sect. I, A. M. M.

CASE.—Private *F. M. Drake,* Co. D, 35th North Carolina Regiment, aged 27 years, was struck by a musket ball, at Petersburg, June 16th, 1864, three inches below the left clavicle. The missile made its exit at the posterior border of the left axilla. He was made a prisoner, and sent to Lincoln Hospital on June 25th. He had full extra diet and simple dressings, and nothing of importance occurred until July 10th, when there was profuse arterial bleeding from the exit orifice, stanched by plugging the track of the ball with pledgets of charpie dipped in solution of persulphate of iron, and applying compresses tightly bandaged in the arm-pit. Bleeding recurred, and the patient died on July 12th, 1864. The *post-mortem* dissection revealed a phagedemic condition of the posterior part of the wound, and the subscapular artery was completely sloughed through at its origin. The specimen was contributed by Acting Assistant Surgeon H. M. Dean; the notes of the case by Acting Assistant Surgeon Thaddeus L. Leavitt, U. S. V.

CASE.—Private Daniel Hughes, Co. K, 13th New York Artillery, aged 23 years, was admitted to the Foster Hospital, New Berne, North Carolina, with an incised and punctured wound of the left side and hip, inflicted with a knife at New Berne on the same day. On admission, there was hæmorrhage from the thoracica longa artery. The patient's condition was good. Assistant Surgeon E. F. Hendricks, 15th Connecticut Volunteers, ligated the bleeding vessel; simple dressings were applied., He recovered and was returned to duty September 27th, 1864. The case is reported by the operator.

CASE.—Private Zeba S. Lyon, Co. I, 17th Vermont Volunteers, aged 20 years, was wounded at Petersburg, Virginia, April 2d, 1865, by a conoidal ball, which fractured the middle and anterior border of the right scapula and the fourth rib, passed into the lower lobe of the right lung, and lodged. He was taken to the field hospital of the Ninth Corps, and, on April 6th, was transferred to Slough Hospital, Alexandria. Light cold-water dressings and stimulants were used until April 14th, when

* Dr. Theodor Bilroth would, perhaps, contest the distal origin of the fatal hæmorrhages in some of these cases. See the fifteenth letter of his recent *Chirurgische Briefe.* But I think the preparations in the Museum would convince him of the frequency of bleeding of this nature.

hæmorrhage occurred from a small branch of the circumflex artery, which was ligated at the time. On the 16th, hæmorrhage recurred from a deeper branch. Several minor branches of the circumflex artery were cut down upon and ligated by Surgeon Edwin Bentley, U. S, V. The patient lost in all about twenty ounces of blood. Nourishment and stimulants were administered. Death resulted on April 21st, 1865. The necropsy revealed the course of the ball. The lower lobe of the right lung had undergone decomposition; the upper lobe was congested.

Doubtless many branches of the thoracic and scapular arteries were occasionally tied to arrest primary or secondary bleeding from wounds, or else in the course of operations; but special references to such instances do not appear on the reports.

This review of the results of ligations in the trunk, after gunshot wounds, is very discouraging, and it can hardly be denied that the excessive mortality was, in a measure, due to departures from accepted rules of practice. But the difficulties in dealing with gunshot wounds of the clavicular and axillary regions are so great, as often to defy the best planned and most skilfully executed surgical interference; and those whose experience of traumatic lesions of the subclavian and axillary regions is largest, are least hasty in criticising failures in their management.

Excisions.—Though excisions of the bones of the trunk, and possibly those of the joints, have been known and practiced from early times, from the time of Galen indeed, it is little more than a century since they have been reintroduced and practiced according to fixed rules as belonging to the established resources of surgery. Until the publication of Park's two letters, in Jeffray's translation of Moreau, in 1806, and Syme's work, in 1831, the English language possessed no book on excisions, and yet, in 1803, the Moreaus had excised nearly all of the larger joints.*

Excisions of the Clavicle.—Extirpation of the collar bone on account of necrosis, or for malignant growths, may be regarded as an established operation of recent date.† Though rarely required in gunshot fractures of the clavicle, in very extensive comminutions the complete excision of the bone may possibly be expedient. It was twice, at least, resorted to during the war; on both occasions with a fatal result. The first case is accredited to a Confederate surgeon, whose name is not given, at the battle of Spottsylvania. The memorandum of the operation appears on the monthly report, for May, 1862, of Surgeon J. L. Cabell, the professor of surgery at the University of Virginia:

Case 1.—Private *Henry Miller*, Co. I, 5th Virginia Regiment, was admitted to the Confederate hospital at Charlottesville, Virginia, May 8th, 1864, with a gunshot wound of the chest and fracture of the clavicle. The clavicle had been excised on the field, on the 6th. He died on May 17th, 1864. The case is reported by Surgeon J. L. Cabell, P. A. C. S.

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* For a fatal case of ligation of the left subclavian in the second portion, for gunshot wound of the axillary, see *Military Surgery and Operations following the Battle of Rivas, Nicaragua*, April, 1856, by I. Moses, M. D., late Surgeon General of the Nicaraguan Army. Besides the authors already cited, consult, on this subject: Nott, J. C., *Ligature of Subclavian Artery for the cure of Axillary Aneurism caused by Gunshot wound*, Am. Jour. Med. Sci., p. 111, Vol. II, 1841; Sir William Fergusson's remarks in the last edition of his *System of Practical Surgery*, London, 1870, and in the later volumes of the *Lancet*; Mr. J. E. Erichsen's observations in the fifth edition of his *Science and Art of Surgery*, London, 1869, Vol. II, p. 86; Mr. J. Spence's *Lectures on Surgery*, Edinburgh, 1871; Sir James Y. Simpson's *Acupressure*, Edinburgh, 1864; Professor Gross's learned critical and historical comments in the fifth edition of his *System of Surgery*, Philadelphia, 1872, Vol. I, p. 804, Vol. II, p. 450; Dr. J. Ashhurst's excellent summary of the present state of our information in his new *Principles and Practice of Surgery*, Philadelphia, 1871, p. 547; Bilroth, *Chirurgische Briefe*, U. S. V., Berlin, 1872, S. 113; George Fischer, in Dr. von Pitha's *Handbuch*.

† Professor Gross informs us (*System of Surgery*, Vol. II, p. 1077) that Remmer extirpated the clavicle for osteosarcoma as far back as 1732. Dr. O. Heyfelder (*Lehrbuch der Resectionem*, Wien, 1863, S. 300) has collected nine cases of total, and eighteen of partial excision of the bone, and ascribes the priority in practicing total excision to Meyer, who operated, in 1823 (*Encyc. Wörterbuch de Med. Wiss.*, B. 29), successfully on a man of 34 years, with caries; but he ascribes a partial resection of the diaphysis to Cassebohm, in 1719 (*Act. Med. Berol.*, B. I). In 1813, Dr. Charles McCreary, of Kentucky, excised the right collar-bone of a boy of 14 years, for scrofulous caries. The boy survived many years, with an excellent use of the corresponding limb. The specimen is in Professor Gross's private collection. Drs. Wedderburn, of New Orleans, in 1852; Blackman, in 1856, and Fuqua, of Richmond, in 1860, had like success in similar cases. Mott, in 1828; J. C. Warren; in 1832, and Dr. E. S. Cooper, in 1837; Dr. Curtis, of Chicago, about the same year, and Dr. Eve, of Nashville, in 1870, performed the operation for malignant tumors. Mott's case alone was successful. For the removal of tumors, the operation is of course far more difficult than in caries; Mott applied over forty ligatures in the course of his operation, which lasted nearly four hours.

Of the next operation of this nature, more particulars are furnished. The operator was Dr. James C. Palmer, now Surgeon General, U. S. N.:

Case 2.—Peter Pitts, a landsman of the United States Ship Hartford, aged 19 years, received a penetrating wound of the chest in action at Mobile Bay, August 5th, 1864. In a communication to the *American Journal of Medical Sciences* for April, 1865, Assistant Surgeon J. R. Tryon, U. S. N., says: "The patient was supposed to have been wounded by a fragment of shell, which entered midway between the articulations of the clavicle of the right side, splintered the bone to both sternal and acromial extremities, fractured the first two ribs near sterno-costal articulation, passed through the apex of the right lung, and made its exit through the scapula just beneath the spine of that bone. The wound of entrance was oval, edges jagged and inverted, with the fractured extremities of the clavicle pressing downward and inward upon the blood-vessels and nerves in that region. The wound of exit was nearly circular, edges lacerated and everted, with spiculæ of bone from the clavicle and scapula protruding. Six hours after the injury, the patient (being quieted from time to time by the inhalation of chloroform) was brought under the attention of the surgeons of the Hartford. After careful examination, finding no portion of the clavicle could be preserved, Dr. James C. Palmer, surgeon of the fleet, removed the entire bone During the dissection, the attachments of the sterno-cleido-mastoid and trapezius to the clavicle were removed; the external jugular was the only vessel tied. The edges of the wound were brought carefully together by the interrupted suture and water dressings applied; the spiculæ of bone were removed from the wound of exit and dressed in the same manner. The patient bore transportation exceedingly well, and, on the afternoon of August 6th, when admitted into the Naval Hospital at Pensacola, symptoms were quite favorable. August 8th: Many additional pieces of bone were removed from the wound of exit and sutures taken from the incision made by the operation. On account of the severe injury to the lung, pneumonia soon supervened, and very little hope of recovery was entertained by reason of the severity of the attack. However, on the 19th, the patient was fully convalescent from the pneumonia; wounds looked favorable, suppurated freely, and healthy granulations were observed throughout the wound of exsection, with sternal point nearly closed. The patient continued to improve till the 22d instant, when he became anxious and restless; bed-sores were soon developed, and, by gravitation of pus at the wound of exit, abscesses formed beneath the scapula, which exposed the entire lower border. *This wound* gradually assumed an unhealthy action; patient became emaciat d, and died of exhaustion at twenty minutes after seven o'clock P. M., August 20th, 1864, twenty-five days after the injury and operation. At the time of his death the wound of excision had entirely healed near the sternal end, and was filling up rapidly by healthy granulations near its outer extremity. With this evidence of repair we can safely state the perfect success of the operation, and but for the severe wound of the scapula the probable recovery of the patient. Treatment throughout: Tonics, stimulants and anodynes, and during the different stages of pneumonia, the usual course was pursued." At the necropsy, on examining the thorax, about one-fifth of the upper portion of the right lung was found to have been destroyed, probably by the missile, in conjunction with the subsequent suppuration. This cavity was lined with a tough membrane three lines in thickness, dividing it from the lower portion of the lung, which was found to be perfectly healthy. Direct communication had existed between the anterior and posterior wounds.

Unless complicated by serious injury of the lung, nerves, or great vessels, it would not appear that the operation is necessarily a very fatal one. Six of nine cases of extirpation of the clavicle collected by Dr. O. Heyfelder (*op. cit.* S. 300) were perfectly successful, and several other successful operations have since been reported.

Partial excisions of this bone for necrosis, or compound fracture, or dislocation are more common. Some surgeons (Dr. E. C. Cooper, Assistant Surgeon Ayres, U. S. V.) practice excision of the sternal portion of the clavicle to facilitate operations on the brachio-cephalic or the first portion of the subclavian. The sternal extremity is a favorite seat of syphilitic caries, which may require gouging or partial excision. The three following cases of excision of the outer third, inner third, and middle third of the clavicle were fatal, but were complicated by gunshot perforations of the lung:

Case 3.—Corporal M. C. Pember, Co. D, 33d Wisconsin Volunteers, aged 23 years, was wounded at the battle of Spanish Fort, Alabama, April 3d, 1865, by a conoidal musket ball, which fractured the right clavicle, and perforated the upper lobe of the right lung. He was received into the field hospital of the Sixteenth Corps, where resection of the outer third of the clavicle was performed by Surgeon Edwin Powell, 72d Illinois Volunteers. Several days afterward the wounded man was transferred to the Marine Hospital at New Orleans, Louisiana, where he died on April 12th, 1865.

Case 4.—Private Charles Baker, Co. D, 31st United States Colored Troops, aged 20 years, was wounded at Petersburg, Virginia, July 30th, 1864, by a conoidal ball, which entered at the middle of the right scapula, penetrated the right lung, and emerged, fracturing the inner third of the clavicle. He was treated in the hospital of the Ninth Corps until August 17th, when he was transferred to Satterlee Hospital, Philadelphia. When admitted, the outer end of the denuded clavicle was protruding, and the patient was suffering from bed sores, which became worse. Appliances for the bed sores were made. On September 8th, the protruding portion of the clavicle was excised. Simple dressings were applied, and stimulants and tonics administered. September 25th: System becoming exhausted from the suppuration. October 4th: A pyæmic chill occurred. Death resulted on October 6th, 1864, from pyæmia. The case is reported by Surgeon I. I. Hayes, U. S. V.

Case 5.—Corporal Freeman Scott, Co. L, 21st Pennsylvania Cavalry, aged 18 years, was wounded at Chickahominy River, Virginia, June 2d, 1864, by a conoidal ball, which struck the left clavicle about its middle, producing a comminuted fracture, passed downward and backward, and lodged apparently beneath the scapula. He was admitted to Stanton Hospital, Washington, on June 4th. The wound was suppurating profusely but of good quality; the broken ends of the clavicle overlapping each other; they were denuded of periosteum and bathed with pus; they were surrounded by a cavity filled with pus, which extended down almost to the artery, and there was great danger that the sharp end of the underlying fragment would be driven into the artery by an unlucky movement of the elbow. The general health of the patient was favorable. On June 13th, 1864, ether was administered, the wound of entrance dilated by an incision on the front of the clavicle, and two inches of its middle third excised with a chain saw and the osteotome, great care being taken that the subclavian artery should receive no detriment. The portion resected was denuded of periosteum and lying in a cavity filled with pus. Death occurred from pleuritis on June 23d, 1864. The case is reported by the operator, Surgeon John A. Lidell, U. S. V.

The three following cases had a more successful issue:

Case 6.—Sergeant J. H———, Co. I, 9th New York State Militia, was admitted to the hospital at Frederick, Maryland, September 23d, 1862, with a gunshot wound of the shoulder, received at Antietam on the 17th, by the bursting of a shell. On examination, it was found that the outer half of the clavicle had been torn away; this, with a fracture of a portion of the spine of the scapula and of the acromion process, allowed the shoulder to drop down. The soft parts above the joint had the appearance of having been much torn and lacerated and were in a sloughy condition. Stimulating dressings were applied, and in about two weeks the slough separated, leaving a granulating ulcer six inches in length and four in breadth. Although the sloughing had been quite extensive, the joint remained uninjured. Doctor Gordon Buck, of New York, while inspecting the hospital, had seen the case, and advised an operation, which he performed on October 12th. The patient was etherized, and the outer portion of the clavicle as far as the attachments of the sterno-cleido-mastoid muscle was removed by chain-saw. The integuments above and below were then dissected up and brought together by iron-wire sutures. The forearm was bent at a right angle with the arm, which was raised to a level with the shoulder and put in position by Smith's anterior splint. The case progressed very favorably; on December 12th, a tubular sequestrum, about two and one-half inches in length, was removed; on the 16th, another small piece of bone came away. On January 16th, 1863, the patient's general condition was good. An examination with a probe revealed some small fragments of bone, which had prevented the complete cicatrization of the wound. He was discharged from service on March 13th, 1863, at which time there was paralysis of the arm. The acromial and outer cylindrical portions of the necrosed clavicle were forwarded, with a history of the case, by Assistant Surgeon R. F. Weir, U. S. A., and are represented by the wood-cut (Fig. 256). Pension Examiner W. M. Chamberlain reports, March 20th, 1863: "There is no power in the arm, and the wound is not fairly closed. Disability mostly permanent."

Fig. 256.—Sequestra from left clavicle. *Spec.* 3844, Sect. I, A. M. M.

Case 7.—Lieutenant Colonel H. N. Whitbeck, 65th Ohio Volunteers, aged 37 years, was wounded at Kenesaw, Georgia, June 27th 1864; the missile fractured the left clavicle in its middle third, and lodged in the cavity of the thorax. He was taken to the hospital of the 2d division, Fourth Corps, where simple dressings were applied to the wound. On July 2d, he was transferred to Officers' Hospital, Nashville, Tennessee. The wound was inflamed and discharging thin sanious pus; granulations exuberant; patient feverish and restless; pulse 110. On June 15th, Acting Assistant Surgeon J. A. Hall excised two and one-half inches of the middle third of the clavicle through an incision three inches long. He was furloughed on August 1st, and was afterward placed on court-martial duty at Nashville, until finally discharged from service on August 16th, 1865. Pension Examiner A. D. Blein reported, December 2d, 1865: "Ball entered left lung; not yet extracted. Wound not healed. Another ball passed through arms, entering the side of the body, passing out on the other side superficially. Disability total but temporary." Lieutenant Colonel Whitbeck visited the Army Medical Museum, January 13th, 1870, at which date he stated the wound had not permanently healed. It had re-opened four times during the previous year. He enjoyed comparatively good health. He was a pensioner in March, 1872.

Case 8.—Private J. H. N———, Co., B, 10th Ohio Volunteers, aged 25 years, a robust German, was wounded at Perryville, Kentucky, October 8th, 1862, by a minié ball, which passed through the left shoulder and shattered the acromial half of the clavicle. He also received a gunshot wound of the left hand. He was taken to the field hospital, where the ring finger was amputated at the metacarpo-phalangeal joint. On October 14th, he was transferred to No. 1 Hospital, New Albany. On the 17th, the acromial half of the bone was removed at the articulation, through a straight incision, by Acting Assistant Surgeon A. S. Greene, who contributed the specimen, represented of natural size in the adjacent wood-cut (Fig. 257), with notes of the case. Shreds and strips of periosteum were left in the whole course of the removed bone, and the wound was closed by numerous stitches of iron wire. No adhesive strips were applied. He was discharged from service on January 6th, 1863, at which time perfect new bone had formed throughout the wound. The shoulder drooped forward a little, but the motion was good. This pensioner was paid to June, 1867, and Pension Examiner W. Owen reports his disability total and permanent. The specimen was forwarded by Surgeon W. Varian, U. S. V.

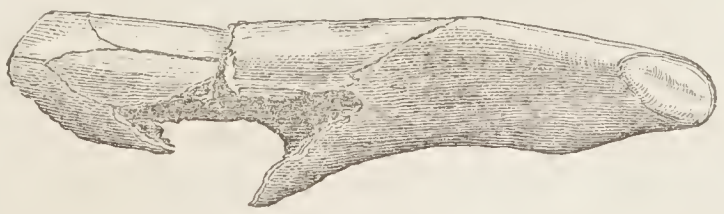

Fig. 257.—Shattered acromial half of left clavicle, excised for gunshot fracture. *Spec.* 372, Sect. I, A. M. M.

In some of the gunshot fractures of the clavicle described on pages 483 and 522, splinters of bone were removed. In the following interesting case, the fractured ends of the bone were removed:

CASE 9.—Sergeant J. M. Woodell, Co. I, 53d Massachusetts Volunteers, aged 45 years, was wounded at Port Hudson, Louisiana, May 27th, 1863; the missile entered near the sternal end of the right clavicle, passed backward and outward, comminuted the clavicle and neck of the scapula, the acromion and coracoid processes of which it fractured, and escaped through the scapula, just below the spine. It also fractured the first and second ribs at their middle, wounded the subclavian artery and vein, and injured the brachial plexus. The patient was conveyed to New Orleans, and admitted, on the 29th, to the University hospital. The loose fragments of bone were removed, the fractured ends of the clavicle rounded off, and cold-water dressings applied. Death resulted on June 7th, 1863. While in hospital, and for several hours after death, the right side of the chest and right arm were several degrees warmer than the corresponding parts of the left side. The necropsy revealed the injury done by the ball. The subclavian artery was not opened, though the inner coats were much lacerated, where the artery passed over the first rib, so much so that the vessel was torn in removing it. The subclavian vein was torn, and an imperfect coagulum filled up its cavity. The outer cord of the brachial plexus was torn across. Specimen No. 1304, Sect. I, A. M. M., shows the clavicle, scapula, and first and second ribs of the right side. It was contributed, with a history of the case, by Assistant Surgeon P. S. Connor, U. S. A.

The subject of the following fatal case of partial excision had undergone an amputation at the wrist:

CASE 10.—Corporal *W. H. Husky*, Co. I, 3d South Carolina Regiment, while in the act of firing, November 18th, 1863, was wounded by a ball from an Enfield rifle, which struck the *left* hand, injuring it severely, and, after passing through many folds of blanket, struck the *right* clavicle about two inches from the sternal articulation, fracturing and comminuting the bone for the space of about two inches, and splitting the sternal end to within a half inch of the articulation; it then passed through the upper part of the humerus, entering at and breaking the inferior edges of the cartilaginous surface of the head of the bone, and coming out near the upper part of the attachment of the teres major and latissimus dorsi. On the next day the left hand was amputated about an inch above the wrist. In a report of the case the *Confederate States Medical and Surgical Journal*, Vol. I, page 159, Assistant Surgeon R. L. Johnson, P. A. C. S., says: "The case came under my charge on the 4th of December, at which time nothing was known of the position of the ball. The surgeon who first examined the case was necessarily ignorant of the fact that the humerus was injured, for it was not broken in two, but shot through, which caused, however, some splintering. December 5th: Wrist (stump) doing well; right arm very much swollen, probably on account of an abscess in the anterior part of the shoulder, which presses on the veins. December 16th: Ligatures came away from the stump. December 19th: Ordered whiskey, eggs, milk, and other nourishing diet, which have just been obtained for the first time. December 24th: The discharge of pus is now from one to two gills per day. It escaped by overflowing of the wound at the clavicle, the quantity being much augmented by pressure on the anterior part of the shoulder, over the abscess. December 25th: Dr. Spinks, of Humphrey's brigade, and Dr. North, of Anderson's, were consulted to-day, and it was agreed: 1st. To put the patient under the influence of chloroform, in order to make a thorough examination. 2d. To remove the ball, if its position could be ascertained. 3d. If the shoulder-joint has not been injured, or any other serious injury been done by the ball in its progress, to remove all necrosed portions of the clavicle. December 26th: Through the kindness of one of the Federal surgeons at Knoxville, I procured a good and complete set of resecting instruments. December 27th: The following operation was made to-day, Assistant Surgeons Spinks, Bygott, and Cotten, and Dr. Allen, being present: The patient having been anæsthetized, was placed upon the table, and a large gum cathether was introduced into the wound and passed outward along the sinus to the anterior part of the shoulder, where there was a collection of pus, and where the ball was supposed to be. Nothing more was gained by this step than a knowledge of the exact position of the abscess. The arm was then moved about to ascertain whether or not the humerus was fractured; and as there was no crepitus, no displacement, and no impairment of the movements of the joint, it was decided that the humerus and shoulder-joint were intact. An incision about two inches long was then made at the anterior edge of the deltoid muscle, and parallel with it, reaching from opposite the head of the humerus to below the neck. After cutting nearly an inch deep through the swollen tissue, the knife entered the abscess. The finger was then introduced, and a large abscess was found with one sinus leading to the wound at the clavicle, and one leading around under the skin and fascia to another abscess, which lay in the posterior part of the shoulder. The first or anterior abscess contained pus and a few small spiculæ of bone. The second or posterior contained dark, filthy pus, and the ball, which was extracted. The clavicle was then resected The existing orifice was enlarged by incisions—one extending nearly to the articulation of the left clavicle and sternum, the other extending over the distal fragment for about two inches. The sternal end was then disarticulated and removed by dissection. All spiculæ were then carefully removed from the wound. These spiculæ were generally furnished on one surface with periosteum, by which they grew to the tissues. Their other surfaces being free, and acting as foreign bodies, were surrounded by pus. There was one point, however, at the bottom of the wound, about one inch and a half long, which was firm and immovable and covered with healthy granulations. This was supposed (at the time) to be a portion of the clavicle from the posterior surface that had never been displaced, and as there was no collection of pus under or around it it was not removed. A chain saw was then passed under the distal fragment an inch from the broken end, the bone sawn in two, and the fragment removed by dissection. Though no veins or arteries of any size were cut, he lost over half a pint of blood, the tissues being very vascular. A few sutures were taken; wet lint was applied; the patient was put to bed, and morphine and whiskey were administered. December 28th: Rested well last night; very pale and languid to-day; without appetite and with some diarrhœa; a counter opening was made into the abscess from which the ball had been extracted; prescribed one grain of opium, ordered eggs, whiskey, &c. December 29th: Has a little more color in his cheeks to-day than he had yesterday; eat squirrel stew with great relish; bowels better;

prescribed tr. catechu, gave whiskey, eggs, milk, &c.; the openings in the shoulder are discharging freely to-day, the discharge from the wound being much diminished. The swelling of the arm is so much reduced as to slacken the bandages, the first of which were applied on the 5th instant, and which had been re-applied every two or three days since. The arm reduced about one-third. December 30th and 31st: Doing well. January 1st, 1864: Doing well; appetite good; wound and incisions granulating; discharge from the wound much diminished, there not being enough to overflow the wound in twelve hours; the discharge from the anterior incision (in which a tent is kept), which is now the outlet from the abscess in the shoulder, is less than the discharge was from the wound before the operation. January 7th: Healthy granulations over the end of the bone, and, indeed, everywhere about the wound; discharge, which is from the shoulder, very slight. January 8th: In the afternoon, some diarrhœa; prescribed tr. opii, tr. catechu in equal parts, twenty drops after each operation on bowels. January 14th: Whiskey supplies have been out since the 7th; diarrhœa has been *constant;* prescribed tannin, catechu, opium, &c., with no effect; losing flesh and getting weaker. January 21st: Diarrhœa constant: patient very weak; procured whiskey to-day. January 26th: During past six days have had good supply of stimulants; patient very weak; diarrhœa continues; will probably not live till to-morrow. January 27th: Died at one o'clock P. M. The *post-mortem* examination revealed the course of the ball. On making an incision from the wound, which had healed to a considerable extent, to the incision on the front part of the shoulder, and from there around to the posterior incision, I found the track of a large abscess. This also extended downward in front, and parallel with the pectoralis minor. At the bottom of this branch abscess there was a spicula of bone half an inch long. The ball had passed through the head of the humerus, but had not broken it in two. *It did not* pass, therefore, in *front* of the *shoulder,* through the sinus by which it was extracted. Wherever any periosteum was left, bone was forming rapidly. The hard, firm place in the bottom of the wound, supposed during the operation to be a spicula from the posterior part of the clavicle, proved to be entirely new bony formation. The abscesses around the head of the humerus were large, and had burrowed back into the shoulder to some extent."

The eleventh and last of the series of operations on the clavicle was for necrosis following a simple fracture:

Case 11.—Private John Q———, Co. E, 9th New York Cavalry, sustained a comminuted fracture of the right clavicle, by his horse being shot during a charge into Winchester, Virginia, June 8th, 1862, and falling upon him. He was conveyed to Washington and admitted to Finley Hospital, where he was found to be suffering from general emphysema, the result, probably, of a wound of the apex of the pleura from some of the fragments of the broken bone. He was treated for this difficulty for a considerable time and finally entirely recovered. Several spiculæ of bone were removed through an incision from under the skin in the situation of the sternal extremity of the clavicle. On October 21st, 1863, he was admitted to St. Joseph's Hospital, Central Park, New York. The wound over the sternal aspect was still open and presented the pouting and indolent appearance indicative of dead bone at its bottom. A probe being passed into this opening disclosed bare bone, which was still firm in its attachments and which was decided to be a portion of the head of the clavicle. His condition was good and it was thought best to wait until the sequestrum should detach itself before any attempt at removal should be made. January 14th, 1864, an abscess formed over the outer third of the clavicle which was opened and showed the existence of dead bone at that point also. Simple applications were made to both wounds. February 10th: The sternal extremity of the clavicle commenced to protrude itself through the inner opening and was found to be connected with and evidently to form a solid piece with that portion of sequestrum felt through the outer opening. It was thought that the whole of that portion of the bone between these two points was dead. There was a considerable amount of thickening around it caused by the deposit of involucrum. The wound discharged slightly. June 1st: The bone was now freely movable in its bed and its sternal end pointed out of the wound for a distance of three-fourths of an inch. Aside from a pain in the right side of the chest and in the right shoulder, with an inconvenience in the motion of the parts, the patient suffered very little and enjoyed a good appetite. On June 21st, 1864, Acting Assistant Surgeon J. K. Merritt removed the sequestrum by slightly enlarging the internal opening. The parts from which this portion of bone was removed soon became firmly braced by a new bridge of osseous tissue, formed by the involucrum, and really constituted a new clavicle. The motions of the arm, though somewhat restrained, were nevertheless good, all the support to the shoulder necessary for the subsequent good use of the limb being left good. The case progressed well until July 16th, when the wounds covered themselves with an ashy slough and hospital gangrene fairly declared itself. On the 10th, a thick, angry-looking slough covered both wounds; the edges of the openings were tumid and inflamed. The surfaces of the ulcers were touched with bromine, but the sloughs were so thick that the remedy failed to have the desired effect. On the 14th, the sloughs were removed and bromine applied directly to the part. By the 16th, the gangrene had extended itself into the track which communicated between the two wounds. The patient complained of a great deal of pain and soreness. Bromine was introduced into the track of the wound, but owing to the presence of the slough and the difficulty of removing it, the remedy could not be brought in direct contact with the surfaces underneath. The parts were repeatedly touched with bromine and bathed with a wash made of the same. Under this treatment they assumed a healthy aspect and the patient commenced to do well. By September 19th, the parts had entirely healed; there was a marked enlargement from deposit of new bone at the seat of exfoliation. The soldier was discharged from service October 1st, 1864; the arm was useful and nearly all the normal movements could be made with it. The sequestrum is represented in the adjoining wood-cut (Fig. 258). It is partially tubular and is about three inches in length. The sternal articular surface is destroyed as well as all the cancellous structure in the longitudinal diameter of the bone. It is evident, too, that the acromial end of the clavicle did not become necrosed, and the deficiencies of the compact tissue of the head portion of the bone may be accounted for by the removal of the several small fragments at the hospital at Washington. The excavation on the anterior

Fig. 258.—Tubular sequestrum from necrosis of right clavicle. *Spec.* 4332, Sect. I, A. M. M.

face of the bone was probably caused by the removal of two or three detached fragments at that time. If there were any small fragments toward the sternal end, as doubtless there were, they must have been firmly attached to the periosteum and become incorporated with the involucram, and helped to form the firm bridge of bone which exists over the subclavian vessels. The specimen was contributed, with a history of the case, by Acting Assistant Surgeon G. F. Shrady.

Excisions of Portions of the Scapula.—The comparative frequency of fracture of the shoulder-blade in gunshot wounds of the chest has been referred to on page 484 of this Chapter, and examples are there cited of the removal of loose splinters of bone, as part of the ordinary dressing of such injuries. Sometimes, it is necessary to excise undetached portions of bone, to facilitate the extraction of projectiles, fragments of clothing, or equipments, or other foreign bodies. When great comminution has been produced, it may be advisable to excise considerable portions of the bone. When necrosis involves the larger part of the scapula, it should be extirpated. The last assertion is justified by the argument of Dr. Stephen Rogers, whose admirable paper* on the subject conclusively establishes the apparent paradox that it is safer to excise the whole than a part of this bone. Excision of the entire scapula has thus far been practiced in military surgery only in connection with ablation of the arm; in other words, as an amputation above the shoulder. It was thus successfully performed by Cumming, in 1808, in the case of a man with gunshot comminution of the humerus and scapula, and a similar operation, for the same cause, was successfully practiced by Gætani Bey, in 1830, on a boy of 14 years. Larrey, in 1838, repeated the operation with success on a subject of the same age.

The removal of the entire scapula and preserving the arm is an advance of modern surgery,† which must undoubtedly be acknowledged as a legitimate resource in military practice in cases of extensive necrosis following gunshot fracture. So far, I believe, there is no recorded instance of its employment; although Dr. Neudörfer, of the Austrian army, in 1862, successfully removed the greater part of the scapula, in a case of necrosis caused by gunshot comminution In our late war, the several partial excisions enumerated in the following series were practiced:

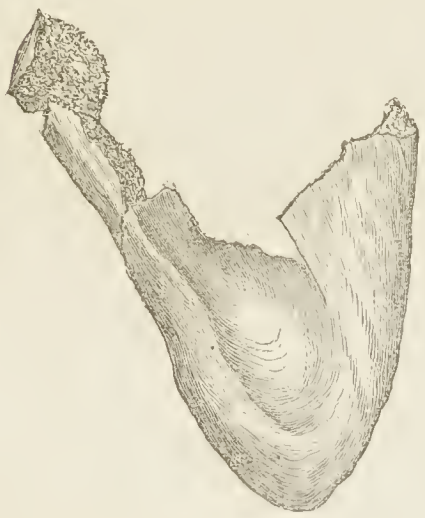

FIG. 259.—Portion of left scapula successfully removed after a gunshot injury. *Spec.* 1090, Sect. I, A. M. M.

CASE 1.—Private F. E. Bickett, Co. F, 5th Connecticut Volunteers, aged 51 years, was wounded at Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball, which struck the infra-spinatus fossa of the left scapula about midway between its inferior angle and the spine, passed forward, splintered the bone extensively, and finally lodged in the glenoid cavity without injuring the humerus. He was treated in the field hospital of the 1st division, Twelfth Corps, until the 6th, when he was sent to Lincoln Hospital, Washington. An operation, for the removal of the ball, discovered a large number of shattered fragments lying near the joint, which were dissected out from their ligamentous attachment and withdrawn. The lower portion of the scapula being now entirely separated from the upper, and, not knowing to what extent the inferior portion of the bone had been splintered, it was determined to remove it rather than risk the effects of the prolonged discharge from the remnant. Chloroform was administered, and the operation performed by Surgeon H. Bryant, U. S. V. The spine and supra-spinous fossa were preserved. The smooth head of the humerus was visible through the wound. The patient did remarkably well. No bad symptoms supervened, and he gradually regained his strength. The incision made for the removal of the bone filled up without sinuses or discharge of exfoliations. On August 20th, he was furloughed for sixty days. Upon returning, the wound had entirely

* ROGERS, S., *Case of Excision of the Entire Scapula, to which is added a History of the Operations involving a Removal of all or a Considerable Part of this Bone; with the view of establishing the surgical Character and Prognosis of this Class of Operations.* In Am. Jour. of the Med. Sci., N. S., Vol. LVI, p. 359, 1868.

† "Entirely a modern achievement in surgery," said Sir William Fergusson (*Lectures on the Progress of Surgery*, London, 1867, Lecture 2, p. 47), and awarded the credit of first practicing it to Syme. It was first performed by B. von Langenbeck, in 1855, for osteocephaloma, in a boy of 12 years; next by Syme, for a "sanguineous cyst of the bone," in a woman of 70 years; third, by Dr. J. F. Heyfelder, in 1857, for caries in an adult, who died on the eighth day of pyæmia (*Deutsche Klinik*, 1857); by Mr. Jones, of Jersey, in 1858, (*Med. T. & G.*, December, 1858) for caries in a girl of 15 years, who had a most useful arm six years afterward; by Dr. Hammer, in 1860 (St. Louis Med. Reporter), for osteo cancer, in a girl of 18 years; by Syme, in 1860, for osteo-cancer; by Professor Schuh, in 1860, for osteo-cancer in a child of 8 years; by M. Michaux, in 1864, for encephaloma; by Dr. S. Rogers, in 1867, for osteo-cancer (*l. c.*, p. 389). Eight of the nine patients recovered, and the majority retained useful arms. I am indebted to the masterly paper by Dr. Rogers, above referred to, for these references, and for most of the information on which the comments on this series of cases is

healed. The use of the fore-arm and hand were perfect, though the motion of the arm, as was anticipated, was impaired by the loss of support of the head in the glenoid cavity. It had fallen back slightly from its natural position. The arm, from weakness, was still worn in a sling. The patient was enabled to eat, tie his cravat, brush his hair, button his clothes, etc., with the affected member, and its strength and usefulness were daily increasing. On January 14th, 1864, Bickett was transferred to Connecticut, and finally discharged from service in March, 1864. The pathological specimen was contributed, with this history of the case, by the operator. It is figured in the preceding cut (FIG. 259). This man is a pensioner. On May 27th, 1867, Pension Examiner R. Strickland reports that the arm is utterly useless and painful, and rates the pensioner's disability as total and probably permanent.

The result in this case would probably have been even more favorable, if, after the removal of the head of the bone, the spine, acromion, coracoid, and superior border had also been extracted and the extirpation made complete, for the pension examiner's report appears to indicate that the mutilated remnants of bone give trouble.

In a successful case of decapitation of the head of the humerus, which will be noticed in the section on *excisions at the shoulder*, Surgeon O. A. Judson, U. S. V., excised a considerable portion of the coracoid process, the movements of the arm remaining very well preserved. Dr. Judson also operated in the following case, removing large fragments of the infra-spinous fossa to extract an impacted ball:

CASE 2.—Private J. B———, Co. H, 7th Massachusetts Volunteers, aged 34 years, having been wounded at Chancellorsville, on May 3d, was sent to Washington, and admitted to Carver Hospital on May 9th, 1863. A bullet had entered the left shoulder just below the coracoid process of the scapula, lodging near its neck in the substance of the infra-spinatus muscle. The patient's condition, upon admission to hospital, being good, he was allowed a full diet. On May 14th, intermittent fever complicated the case, for which suitable remedies were prescribed. The bullet was removed from the wound, through an incision, on May 21st, the patient being chloroformed. The scapula was much shattered, and the incision being enlarged, fragments of bone were also removed. Intermittent fever and secondary hæmorrhage ensued; the patient sank rapidly, and died on May 25th. The specimen, figured in the adjoining wood-cut (FIG. 260), was contributed to the Army Medical Museum, with a memorandum of the case, by the operator, Surgeon O. A. Judson, U. S. V.

FIG. 260.—Fractured scapula, with a split ball attached. *Spec.* 1211, Sect. I, A. M. M.

The following operation was practiced also under the direction of Dr. Judson, to whose lot fell an unusually large number of injuries of this description. See *ante*, FIGS. 220 and 224, pages 483 and 485:

CASE.—Private George R. M———, Co. E, 84th Pennsylvania Volunteers, aged 29 years, was wounded at the Wilderness, Virginia, May 6th, 1864, by a conoidal ball, which entered at the superior angle of the scapula, passed backward, producing a compound comminuted fracture of the spine of the left scapula and remained in the wound. He was treated in the field until the 14th, when he was transferred to Carver Hospital, Washington. When admitted, his constitutional condition was excellent and the injured parts were in good condition; there was not much swelling but considerable pain. On May 17th, Acting Assistant Surgeon William E. Clark administered chloroform and excised the fractured spine of the scapula through a straight incision immediately over it. He also removed the ball. The wound was then filled with charpie, and cold-water dressings applied. The patient reacted well from the shock of the operation and continued to improve, the wound granulating rapidly and secreting a quantity of laudable pus. On June 17th, 1864, he was furloughed, and, on September 10th, admitted to Satterlee Hospital, Philadelphia, whence he was transferred to the

FIG. 261.—Portion of spine of left scapula fractured by a conoidal ball. *Spec.* 2294, Sect. I, A. M. M.

FIG. 262.—Conoidal ball removed from the injured spine.

based. The merit of priority in proposing to remove the scapula and save the arm belongs to Liston (1819). The names of American surgeons are honorably connected with this advance in surgery. In 1850, Professor Gross successfully removed the scapula entire, with the exception of the glenoid cavity and end of the acromion, preserving the arm; in 1860, Dr. Walter, of Pittsburg, removed all of the scapula except the neck, glenoid cavity, and acromion, in a boy of 17 years, with caries, preserving a useful arm (Am. Jour. of Med. Sci., 1861); in 1837, Mussey excised the scapula for an enormous osteo-sarcoma, in a man whose arm had been amputated six years before; the patient was well fifteen years after the second operation. McLellan, 1838, removed the scapula, arm, and portion of clavicle successfully, in a boy of 17 years, with osteocephaloma; Gilbert, in 1846, successfully performed another of these amputations above the shoulder, and so did Dr. Gurdon Buck, in 1864, in a man who had previously lost the arm, for osteo-cancer. Dr. Schuppert, of New Orleans, operated successfully, in 1868, for osteochondroma. Dr. Hammer operated a second time, in 1869, unsuccessfully.

Veteran Reserve Corps, January 17th, 1865. Discharged from service on September 14th, 1865. The wood-cuts (FIGS. 261 and 262) on the preceding page show the acromion and upper third of the spine of the left scapula, and the missile causing the fracture. It was contributed, with a history of the case, by Surgeon O. A. Judson, U. S. V. Pension Examiner John McCulloch reports, May 11th, 1866, that "the ball entered and passed over and rather back of the head of the left humerus, shattering the scapula, and was extracted about one-third from the lower point of scapula. Arm can be raised nearly level—carried forward pretty well, but not back. Scapula hollow, arm weak. Disability three-fourths, probably not wholly curable."

In the next case, the operation was practiced for disease not resulting from gunshot injury, but attributed to periostitis induced by the pressure of the knapsack. The report does not state whether a syphilitic or strumous taint existed, but the coincident periostitis of the tibia, a bone not subjected to pressure from accoutrements, establishes a presumption of such a condition:

FIG. 263.—Necrosed portions of the right acromion and spine of the scapula. Size of nature. *Spec.* 415, Sect. I, A. M. M.

CASE.—Private Morris O———, Co. D, 8th United States Infantry, aged 20 years, was treated in the early part of 1862, for intermittent fever. He subsequently suffered with fever paroxysms. About July 1st, he was sent to Fort McHenry. While there, an abscess formed below the tuberosity of the tibia, and one on the top of his right shoulder said to have been caused by the pressure of his knapsack and accoutrements. The abscess on the shoulder began to discharge on July 6th. On August 13th, he was admitted to Camden Street Hospital, Baltimore, suffering from typhoid fever. On August 15th, a portion of the right acromion process of the scapula was excised, and, on the 22d, the spine and the balance of the acromion process were removed by Assistant Surgeon R. Bartholow, U. S. A., on account of ulceration following an abscess. He was discharged from service on November 1st, 1862, and applied for a pension; the pension surgeon, after two examinations, decided that his disability was one-half and likely to continue through life, but the application was rejected for non-compliance with the regulations of the Pension Bureau. The adjacent wood-cut (FIG. 263) shows parts of the necrosed fragments, one and one-half inches in length. The specimen was contributed by Surgeon Lavington Quick, U. S. V., with the above history of the case.

In the case of Private J. P———, 14th Indiana Volunteers, narrated on page 475, the necrosed scapula and upper extremity of the humerus being represented by FIG. 211, Acting Assistant Surgeon W. W. Keen, jr., excised the spine of the bone, a month before the fatal termination of the case from extension of disease to the shoulder-joint and pleural cavity. He removed at the same time a portion of the ball that inflicted the injury. The specimen (FIG. 264) is represented of a size corresponding with the *post mortem* specimen figured on page 475.

FIG. 264.—Spine of the right scapula, excised for necrosis after comminution by a conoidal musket ball, a portion of which is attached. *Spec.* 794, Sect. I, A. M. M.

The accompanying wood-cut (FIG. 265) represents the specimen from the first case, detailed on page 475, of gunshot fracture, with removal of detached fragments of the scapula, and resection of the sharp fractured ends of the clavicle. Though not an instance of formal excision, it is interesting for comparison in this connection.

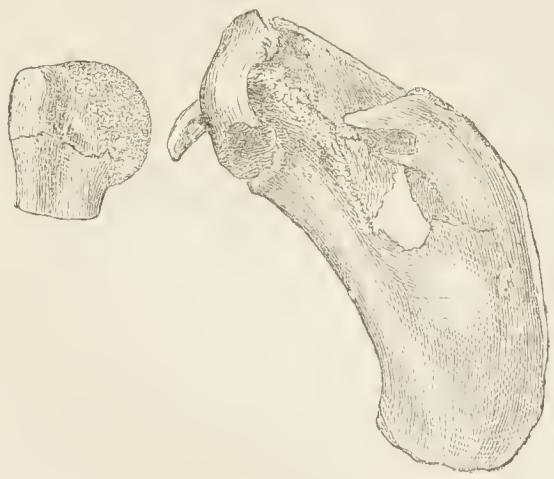

FIG. 265.—Right scapula, portion of clavicle, and head of humerus, showing results of gunshot fracture. *Spec.* 720, Sect. I, A. M. M.

No instance is reported of trephining the scapula, an operation advised in some surgical treatises for the removal of dead bone or of foreign bodies. M. Dubrueil* relates a case in which he resorted to this expedient during the late Franco-German war. The cutting bone-pliers and osteotomes in use are much better adapted than the trephine for such partial excisions as are required on the scapula.

* DUBRUEIL, *Gazette des Hôpitaux*, Paris, Févr. 4, 1871, Velpeau cites Mareschal's cases of trephining the scapula, in the *Mém. de l'Acad. de Chir.*, T, II, Histoire de l'Acad., p. lx.

In the Army of the Loire, at the engagements about Orleans, in October, November, and December, 1871, M. A. Chipault[1] removed large portions of the scapula in three cases of gunshot comminution, as follows:

Case 1.—Gleizal, aged 23 years, 27th marching regiment, was wounded, December 2d, 1870, at Pourpry, near Artenay, and admitted, December 10th, to the ambulance at the Visitation. A musket ball had shattered the sub-spinal blade of the right scapula. On January 26th, 1871, M. Chipault removed about half of the bone below the spine, carefully preserving the periosteum. The patient was discharged, nearly well, April 2d, 1871.

Case 2.—Weber, aged 35 years, 40th marching regiment, received a gunshot comminution of the right scapula at Neuvilliers, December 2d, 1870, the ball entering at the acromion and making its exit at the posterior angle of the spine. Admitted to the Visitation, December 18th, where, on February 11th, 1871, the spine and acromion were excised. There was rapid reproduction of bone, the operation having been sub-periosteal, as described, and the upper extremity regained its functions except abduction of the arm. On May 11th, the patient was discharged from hospital.

Case 3.—Klein, aged 22 years, 33d marching regiment, was wounded at Ormes, October 11th, 1870, by a ball, which comminuted the supra and infra-spinous portions and spine of the right scapula. He entered the Orphan Asylum Hospital July 1st, 1871. There was extensive necrosis, for which M. Chipault excised nearly the entire scapula, the glenoid cavity, coracoid, and acromion being left. The patient recovered and preserved some use of the upper extremity.

Dr. Chipault illustrates these cases by six chromo-lithographs, representing the appearance of the patients after partial recovery, and the pathological preparations of the comminuted scapulæ. M. Chipault also publishes a case communicated to him, by Dr. Charpignon, which may be abridged as follows:

Case 4.—Gérin, 7th battalion, Foreign Legion, at Orleans, October 11th, 1870, had his right scapula comminuted by a ball, which struck between the clavicle and first right rib, and passed out through the shoulder-blade. On October 23d, the wound was enlarged, and several necrosed fragments of the scapula were extracted. Some of them were so adherent that it was necessary to divide the muscular attachments. The patient recovered, and, in December, was sent to serve in Africa. He preserved the use of his arm completely.

Velpeau[2] describes a patient on whom he practiced quite an extensive excision of the acromial portion of the scapula, for a comminution by grapeshot, in Paris, in July, 1830. M. Legouest[3] also mentions a case in which a ball, grooving the external border of the scapula, lodged under the glenoid cavity, so that he was "compelled to resect largely to remove the projectile."

From the Crimean War, but one instance of partial excision for fracture of the scapula is noticed in Matthew's statistical return (*op. cit.*, p. 372). The case is fully described in a paper on excisions, read at the twelfth ordinary meeting of the Crimean Medical Society (*Med. Times and Gazette*, September, 1856), March 20th, 1856, by Surgeon Thornton, of the 9th regiment, the operator in the case. Dr. Watson[4] states that "when attached to the surgical hospital above Balaclava, I had the opportunity of seeing several cases of fracture of the scapula from grapeshot. I recollect one case in particular, where the ball was lodged beneath the scapula, from which position it was extracted by incision about a month after the infliction of the injury. In this instance the whole of the bone was extensively comminuted, its processes alone remaining intact. In spite of this extent of injury, the fragments in great part retained their vitality, and, although the discharge was for a time both copious and exhausting, the part consolidated, and the patient recovered with the loss of scarcely any bone. I have also seen the head of the humerus, the coracoid

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1 M. Chipault, A.—*Fractures par Armes à Feu Expectation, Résection sous-périostée, Évidement, Amputation.* Royal 8°, Paris, 1872, p. 82.

2 Velpeau, Méd. Opérat. (already cited), T. II, p. 571.

3 Legouest, *Traité de Chirurgie d'Armée*, 2ème éd., p. 325. The specimen is preserved at the Museum of Val-de-Grâce. See *op. cit.* Fig. 45.

4 *Edinburgh Medical Journal*, Vol. XV, p. 124, 1869. This writer prints a history of an amputation of the scapula and "adopts," as he terms it, Dr. Stephen Rogers's table, dislocating it into subdivisions. As he "rearranges" it, the priority of excising the entire scapula and preserving the arm would appear to belong to an Edinburgh surgeon, Syme (1856), instead of to Langenbeck (1855). The legitimate fruit of Dr. Rogers's industry is to be preferred to Dr. Watson's adoption.

process, and glenoid surface so injured by a conical ball as to require excision of the head of the humerus and the extraction of the primary fragments of the scapula."

Sir William Fergusson says,[1] "I can scarcely imagine any case of compound fracture of the scapula where removal of the whole of that bone would be justifiable as a primary proceeding." Dr. P. H. Watson says, "To this remark, I most cordially adhibit my concurring testimony." Undoubtedly, a combination of circumstances that would render a primary excision or amputation of the scapula for gunshot comminution advisable can seldom arise; yet, without a very vivid imagination, one may conceive of conditions, resulting from lacerations by large projectiles, which would render primary interference by extirpating the scapula and preserving the arm, or by amputation above the shoulder, not only justifiable but imperative. As a general rule, after removing detached fragments, the military surgeon will await what nature will accomplish in consolidating the fractured bone, and will reserve excision, as an intermediary or secondary measure, in cases of extended necrosis.[2]

Excision or Removal of Portions of the Ribs.—This is a very old operation; but its applications in military surgery are not very numerous or important. The smoothing off very sharp pointed ends of ribs fractured by balls, and extraction of loose fragments, constitute the only admissible primary interference. When necrosis supervenes, more extended operations are required. The cases of Gallagher and Butterfield, printed on pages 506 and 551, describe the ordinary partial excisions resorted to in the ribs. Some details are given in the following series of cases:

Case 1.—Private J. H. Haworth, Co. D, 69th New York Volunteers, was wounded at Antietam, Maryland, September 17th, 1862, by a conoidal ball, which entered on the twelfth rib, right side, two inches anterior to its angle, and emerged on the same rib, posteriorly, six inches from the first wound. He was admitted, on the 24th, to the hospital at Frederick, where, on December 2d, Surgeon H. S. Hewit, U. S. V., excised the posterior portion of the tenth rib on the right side. He recovered, and was discharged from service on January 1st, 1863. His name does not appear on the pension rolls.

Case 2.—Sergeant Edward R. Barker, Co. G, 148th New York Volunteers, aged 33 years, was wounded in the left breast by a conoidal ball, at Fair Oaks, Virginia, October 27th, 1864. He was admitted, on the 29th, to Hampton Hospital, Fort Monroe, where, on January 11th, 1865, a portion of rib was excised. He was furloughed on March 16th, 1865; reported to hospital at Rochester, New York. On July 11th, 1865, he was transferred to Ira Harris Hospital, Albany, New York, whence he was discharged from service on July 29th, 1865. Examining Surgeon John B. Chapin, of Canandaigua, New York, October 16th, 1866, reports: "Ball entered left breast between the nipple and median line, striking the ribs, and emerging below, say, opposite the stomach. The course of the ball after striking the ribs was downward. Four or five ribs were fractured. The disability consists of an extensive cicatrix, involving the intercostal muscles and the origin of the pectoralis major muscle, preventing the use of the arm in a backward direction and interfering with respiration. The applicant states that he is also suffering from gunshot wound in the calf of the leg, received June 3d, 1864, at Cold Harbor, Virginia. Leg lame; foot swells so that he can only wear a boot part of the time."

Case 3.—Private Peter C. Farnsworth, Co. F, 31st Maine Volunteers, aged 17 years, received a shell wound of the right side of the chest at Petersburg, Virginia, June 17th, 1864; the eighth rib was fractured at its centre, and the seventh and ninth ribs denuded on the same line. He was at once conveyed to the 2d division hospital of the Ninth Corps, where simple dressings were applied. On June 20th, he was transferred to Mount Pleasant Hospital, Washington. When admitted, the patient's general health was good. There was slight inflammatory action in the integuments immediately about the wound. The fractured ends of the rib did not interfere with the action of the pleura. June 24th: Inflammation subdued, but no efforts at granulations; stimulant injections and resin cerate dressings. On June 30th, physical signs of pneumonia made their appearance, localized about the seat of injury. July 4th, pneumonia resolved. Wound and adjacent tissues in a sloughing condition. Secondary hæmorrhage occurred from the intercostal artery, which could not be secured on account of the mass of slough. The wound was thoroughly injected with tincture of muriate of iron and plugged with lint saturated with the same. The slough still advancing, the patient was etherized on July 8th, and the wound was thoroughly cauterized with nitric acid; a yeast and charcoal poultice was then applied. The remainder of the slough came away on July 12th; hæmorrhage recurred, and, the artery eluding search,

[1] Fergusson, *A System of Practical Surgery*, 5th ed., 1870, p. 302.

[2] Consult further: Gross, S. D., *Western Journal of Med. and Surg.*, 3d series, Vol. XI, p. 419, 1853; Blackman, G. C., *Am. Jour. of the Med. Sci.*, N. S. Vol. XXXVI, p. 578; Logan, *Richmond and Louisville Medical Journal*, August, 1872, p. 131; the same, *Southern Journal of Med. Sci.*, October, 1867. Dr. F. H. Hamilton (*Prin. and Pract. of Surgery*, p. 395) refers to an excision of the scapula for necrosis after gunshot injury, reported by him in the *N. Y. Med. Journal*, January, 1869. That number is missing in the otherwise complete file in this Office.

the treatment of the 4th was successfully resorted to. The outer ends of the fractured rib were found to have caused irritation by their friction motion on the pleura; and, on the 15th, Acting Assistant Surgeon F. S. Barbarin administered an anæsthetic and removed the diseased portions of the fractured ends of the eighth rib; all the diseased portions of the seventh and ninth ribs looking toward the eighth rib were removed by the nippers and smoothed with a lenticular. But little blood was lost, and the patient reacted promptly. After the excision, the condition of the patient improved in regard to breathing and appetite. He did well until July 25th, when by some sudden movement, while walking in the hall of the hospital with the assistance of crutches, he fractured the ninth rib. July 26th: Treatment continued; quite comfortable, but irritable. August 8th: In a very feeble condition. Suffering acute pain over the whole abdomen, with frequent discharges from his bowels. Pulse 120. He gradually became weaker, and died August 13th, 1864. At the necropsy the upper and middle portions of the right lung were found to be partly adherent to the costal pleura by thin fibrous bands. Assistant Surgeon C. A. McCall reported the case.

Case 4.—Corporal Ellsby McCoy, Co. D, 20th Maine Volunteers, aged 19 years, was wounded at Poplar Grove Church, Virginia, September 30th, 1864, by a conoidal ball, which entered the chest on the left side, fractured the fourth rib, and, glancing, lodged in the axilla on the same side. He was taken to the field hospital of the Fifth Corps, and, on October 7th, was transferred to Lincoln Hospital, Washington. On October 20th, Assistant Surgeon J. C. McKee, U. S. A., administered chloroform and extracted the ball through an incision made along the border of the latissimus dorsi muscle; the end of the fractured rib was also resected. The patient was discharged from service March 23d, 1865. He is not a pensioner.

Case 5.—Private Daniel Fisher, Co. C, 27th Pennsylvania Volunteers, aged 22 years, was wounded at Gettysburg, July 1st, 1863, by a conoidal ball, which entered the lumbar region three inches to the left of the spine, passed superficially upward and outward for about six inches, and lodged in the walls of the chest. He was at once conveyed to the field hospital, where the ball was removed, with a piece of the rib, on July 4th. He subsequently fell into the hands of the enemy, was paroled in a few days, and, on the 11th, entered Turner Lane Hospital, Philadelphia. Water dressings were applied to the wound. He improved rapidly, and was returned to duty August 12th, 1863. The missile, obliquely flattened on one side of the body as if from contact with a stone, was contributed to the Army Medical Museum, with a history of the case, by Assistant Surgeon C. H. Alden, U. S. A., and is represented by the adjoining wood-cut (Fig. 266).

Fig. 266.—Musket ball flattened by impact with bone. *Spec.* 4530, Sect. I, A. M. M.

Case 6.—Private Andrew J. Tucker, Co. F, 7th Indiana Volunteers, aged 18 years, received a gunshot wound of the right arm and right side, fracturing the ninth rib, at Petersburg, Virginia, July 28th, 1864. He was taken to the field hospital of the Fifth Corps, where splints were applied to the arm. On August 1st, the arm was amputated at the junction of the middle and the upper thirds by Surgeon C. H. Van Tagen, U. S. V. He was transferred to Lovell Hospital, Portsmouth Grove, Rhode Island, August 7th. When admitted he was suffering considerable pain; appetite poor. On August 12th, Acting Assistant Surgeon E. Seyffarth administered an anæsthetic and removed a portion of the ninth rib through an incision three inches long. Simple dressings were applied. The patient did well until September 10th, when he began to fail, and, in spite of stimulants, died from exhaustion, with empyema, September 24th, 1864. The specimen of the amputated arm is No. 4725, Sect. I, A. M. M., and was contributed by the operator.

Here may be a suitable opportunity for adverting to some other varieties of fractures of the ribs than those described on pages 488, 490,* and 521. The history of the case that furnished the curious perforation of the rib represented in the cut (Fig. 267) is printed on page 446 (Bugler, William B———), with *wounds and injuries of the spine*, the ball having also perforated the body of a vertebra. The missile has executed the first step in one of the proposed methods for ligation of the intercostal artery. The following case exemplifies the rare occurrence of a "willow-fracture" produced by a musket ball:

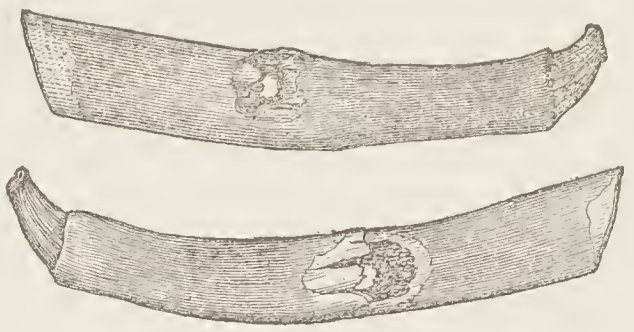

Fig. 267.—External and internal views of the anterior third of the eleventh right rib, perforated by a carbine ball. *Spec.* 3291, Sect. I, A. M. M.

Case.—Private *William T*———, Co. C, 33d North Carolina Regiment, aged 21 years, was wounded at Fredericksburg, Virginia, May 3d, 1863, by a conoidal ball, which entered the right side at the eighth intercostal space. He lay on the field during the night in a rain storm and on the next day was conveyed to the field hospital, where he was treated until the 8th, when he was transferred to Lincoln Hospital, Washington. When admitted, his breathing was very laborious; pulse rapid, quick, and non-compressible; expression of the face anxious; sputa frothy and firmly adherent to the cup; breathing carried on principally by the left lung. He said the saliva had been tinged with blood. Sedatives and expectorants were administered. May 19th: Patient suffers from cough, causing intense pain in side. He continued to fail, and died May 21st, 1863. At the necropsy the right lung was found to be compressed, collapsed, and pushed forward; parenchyma pale red; small bronchial tube prominent. The posterior surface was covered with a thick layer of recent yellowish lymph; the anterior surface was of a pale greyish blue color and free from lymph. As viewed *in situ* the lung extended from the first to the sixth rib, projecting

* See *ante*, Figs. 224, 228, 229, 231, 233, 235, 236, 240.

anteriorly nearly to the median line. The portion not visible was firmly bound to the ribs and anterior portion of the diaphragm by adhesions. The lung was separated from the costal pleura by a large quantity of purulent matter measuring twenty-four ounces. The diaphragmatic and costal surfaces were covered with a thick layer of lymph similar to that observed in the lung. The ball had entered the body on the right side, in the eighth intercostal space, passed slightly downward and inward, fracturing the ninth rib a little anteriorly to its angle, passed through the diaphragm and upper posterior part of the right lobe of the liver, reëntered the pleural cavity, having made a wide ragged track, and was found lying on the diaphragm. The track of the ball was lined with lymph. The missile would appear to have struck the rib sidewise, and being much flattened (FIG. 269), after partially fracturing the rib to have been deflected into the ninth intercostal space.

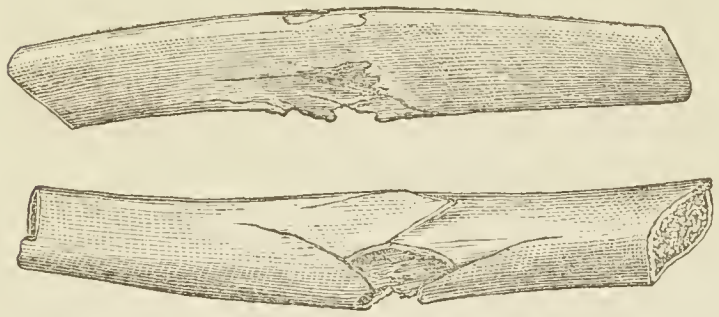

FIG. 268.—External and internal views of a section of the right ninth rib, with a gunshot willow-fracture. *Spec.* 1141, Sect. I, A. M. M.

FIG. 269.—Musket ball flattened by lateral impact on a rib. *Spec.* 1141, Sect. I, A. M. M.

The peculiar fracture of the rib is shown in the wood-cut (FIG. 268). The bone and missile are mounted together in the Museum specimen, which was contributed, with notes of the case, by Assistant Surgeon Harrison Allen, U. S. A.

Though specimen 3823, of willow fracture of the left fourth rib, by a glancing shot, referred to on page 490, was from a slender man, who gave his age as twenty-eight years, yet we should anticipate that such lesions would occur commonly in very young subjects. A more common form of gunshot fracture is represented in the adjacent wood-cut (FIG. 270) from a specimen taken from a man of 46 years, wounded by a small fragment from a shell, at the battle of Mission Ridge.

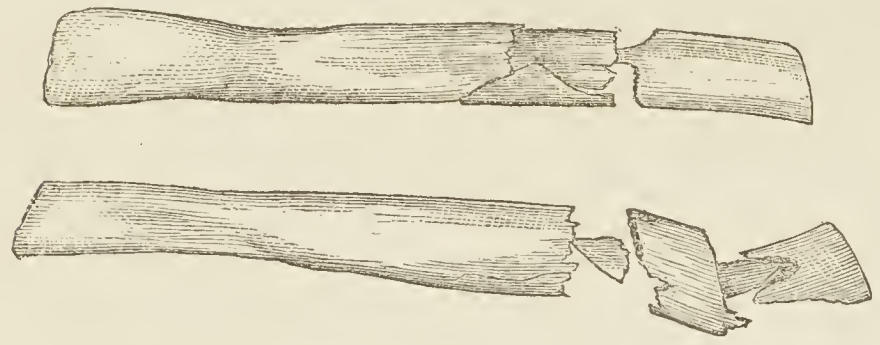

FIG. 270.—Anterior two-thirds of the fourth and fifth ribs comminuted by a shell fragment. *Spec.* 2183, Sect. I, A. M. M.

In the following remarkable case, the patient succumbed from dysentery, and it was possible to observe the morbid alterations at the seat of fracture more than eight months after the injury was inflicted:

CASE.—Private *Thomas P. C. C———*, Co. A, 9th Mississippi Regiment, aged 19 years, was wounded near Petersburg, Virginia, November 5th, 1864, by a conoidal ball, which entered the posterior portion of the left thorax, passed between the tenth and eleventh ribs, fracturing the latter, as well as the transverse process of the eleventh dorsal vertebra. He was treated in a Confederate hospital at Richmond, and, on May 6th, 1865, was admitted into the hospital at Point Lookout, Maryland. On July 24th, he was transferred to Armory Square Hospital, Washington, and, on August 17th, to Douglas Hospital. The patient stated that on the reception of the injury he had a free hæmorrhage from the wound, spat blood, and had great difficulty of breathing, but that he was doing well until about the middle of June, when he was attacked with diarrhœa. On his admission to Douglas Hospital he was terribly emaciated—almost a living skeleton. On the 18th, the ball, which had lodged behind the tenth rib about one and a half inches from the wound of entrance, was removed by Assistant Surgeon William F. Norris, U. S. A In spite of the free administration of beef tea and stimulants, with astringents and injections of nitrate of silver for his dysentery, the patient sank rapidly, and died August 20th, 1865. An autopsy was made thirteen hours after death. There were strong pleuritic adhesions between both lungs and the walls of the thorax. The lungs were healthy except the lower lobe of the left lung, which was collapsed and firmly adherent to the walls of the chest near the seat of injury, in such a manner as to form a cavity of considerable dimensions between the wall of the chest and the lung substance. The liver and kidneys were fatty, the spleen healthy, the intestines shrunken and pallid, but everywhere healthy except the descending colon and rectum, where the solitary glands were much enlarged and had ulcerated. They presented the appearance of small cysts, the size of a pea, with minute circular openings at the summit, and contained a transparent gelatinous mass. The pathological specimen is represented in the accompanying wood-cut (FIG. 271). The wound of entrance in the fractured rib is well rounded, and the two are firmly agglutinated by osseous deposit. The preparation was contributed, with a history of the case, by the operator, Assistant Surgeon W. F. Norris, U. S. A.

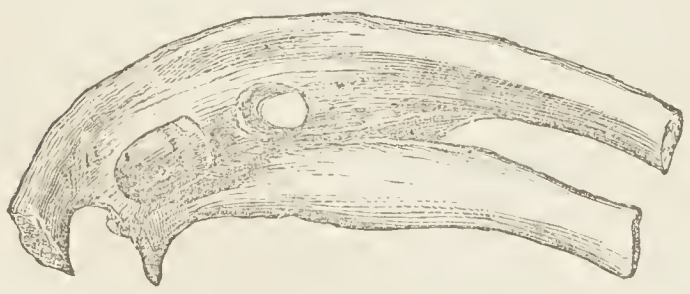

FIG. 271.—Posterior halves of tenth and eleventh left ribs, showing a consolidated fracture by a conoidal ball, which is attached. *Spec.* 1561, Sect. I, A. M. M.

CASE.—Sergeant James K———, Co. A, 35th Indiana Volunteers, was struck, November 25th, 1863, by a fragment of shell in the left chest, the missile penetrating the thorax. He was taken to one of the field hospitals of the Fourth Corps, where some fragments of bone were extracted and the ragged wound dressed simply, and the ribs confined by a broad chest bandage There was much dyspnœa and anxiety, but little hæmorrhage. The missile had lodged in the thorax. On December 1st, the patient was sent by rail to Nashville, and entered Hospital No. 1 on December 3d. His pulse was feeble, surface pale, tongue coated and dry. There was an offensive sero-purulent discharge from the wound, and a dry, hacking cough. He had pneumonia. He was treated by small doses of morphia, with iron and quinine, and milk punch. On the 11th, he had chills, and, on the succeeding days, rigors, with excessive reaction. He died from exhaustion on December 16th, 1863. There was a copious thin purulent exudation within the left pleural cavity. The missile lay in the costo-diaphragmatic angle. Acting Assistant Surgeon W. H. Matlock forwarded the specimen, and the memorandum of the history was transmitted by Surgeon Caleb W. Hornor, U. S. V.

Not uncommonly a ball striking a rib at short range would drive before it such considerable fragments of the bone as would constitute two or more inches of its shaft. Such injuries were rarely attended by bleeding from the torn arteries, but often by free hæmorrhage from the lacerated pulmonary tissue. The adjacent wood-cut (FIG. 272) represents a specimen from such a case, in which the sharp, jagged extremities of the rib had not been rounded off by bone forceps.

FIG. 272.—Section of ninth right rib, from which more than two inches of the body of the bone were driven into the left lung by a conoidal musket ball. *Spec.* 2423, Sect. I, A. M. M.

CASE.—Private H. C. H———, Co., B, 1st Maine Heavy Artillery, aged 21 years, was wounded May 6th, 1864, at the battle of the Wilderness, by a conoidal musket ball, which perforated both cavities of the thorax, and lodged in the left kidney. The patient was sent to Washington, and died in Lincoln Hospital, June 3d, 1864. The large fragments from the rib were found imbedded in the lower lobe of the left lung, which was in a state of grey hepatization. Surgeon J. C. McKee, U. S. A., contributed the specimen.

In the following case, a ball imbedded itself in the seventh rib, comminuting the posterior wall, but not penetrating the costal pleura, or the periosteum of the inner surface of the rib. The patient survived the injury two months. The fragments of the posterior wall are consolidated, chiefly by cartilaginous formations:

FIG. 273.—Anterior half of the right seventh rib, showing a cavity near the chondral extremity, where a round musket ball was imbedded. *Spec.* 877, Sect. I, A. M. M.

CASE.—Private John D. Y———, Co. H, 4th Pennsylvania Reserves, aged 20 years, received at Mechanicsville, Virginia, June 25th, 1862, three wounds from ball and buckshot; one of the right elbow; another, a superficial one, of the skin, about two inches below the right nipple, and a third, about four inches lower, the ball lodging in the anterior extremity of the seventh rib. His wounds were dressed on the field, and he was then placed in an ambulance train, which joined in the change of base to the James River. From Harrison's Landing, he was sent, in a hospital transport, to Philadelphia, and was admitted to Satterlee Hospital, on July 31st, 1862, He lingered until August 25th, 1862. An autopsy was made by Professor Joseph Leidy, who contributed the specimen represented by the adjacent wood-cut (FIG. 273) and the following notes of the pathological appearances: "The right lung appeared to be sound in the upper lobe, but was collapsed and condensed in the lower ones. There were also extensive pleuritic adhesions; and the pulmonary pleura of the lower part of the lung was much thickened. The pleural cavity was distended with an accumulation of pus and serum. The heart and left lung were normal. The liver was much enlarged and presented some fatty degeneration. The stomach, intestines, and spleen were sound. The kidneys were large and presented some appearance of fatty degeneration of the cortical substance, which, however, was not confirmed by microscopic examination."

Beside the cases that have been cited of excision of portions of ribs, or removal of splinters, or extraction of necrosed fragments, five cases are found on the reports, noted too briefly to admit of precise determination of their nature. They may be included in the following:

MEMORANDUM.—1. Sergeant *S. L. Bowden*, Co. B, South Carolina Palmetto Sharpshooters. October 7th, 1864. Excision of rib. Confederate hospital, Jackson, Mississippi. (*Confederate Register*, No. 49.)

2. Private *Anthony Briggs*, Texas Cavalry. Fragment of shell fractured two ribs, right side, below axilla. April 21st, 1863. Sloughing, exposure of pleural sac. Excision of one and a half inches of rib and a small segment of next rib, exposing the pleura pulmonalis for an irregular space of about one and a half inches square. Recovery. (Field note-book.)

3. Private B——— D———, 40th Illinois Volunteers. Gunshot fracture of seventh rib. Chloroform administered and rib resected. Patient recovered. (Field register.)

4. Private J. Sanner, Co. I, 8th Pennsylvania Cavalry. Gunshot wound fracturing tenth and eleventh ribs, and penetrating liver. Dinwiddie, March 31st, 1865. Excision of portion of injured rib. Discharged September 2d, 1865. (Casualty list.)

5. Private Michael Donnegan, Co. D, 17th New York Volunteers, aged 25 years. Savage's Station, June 29th, 1862. Excision of portion of tenth rib. Nearly well September 9th, 1862.

Dr. J. A. Reagan, of North Carolina, has published (*Am. Jour. of the Med. Sciences*, N. S. Vol. LIV, p. 564, October, 1867) an account of a successful excision of necrosed portions of the right fifth and sixth ribs in a soldier shot through the chest in August, 1863. The ball had entered to the right of the spine, split upon the fifth rib; one piece emerging from the fifth intercostal space, while the other fragment lodged under the sixth rib. In July, 1865, Dr. Reagan, excised the necrosed portions of bone, extracted the ball, and evacuated a pleural abscess containing three pints of pus. The patient recovered rapidly, and, twenty-five months after the operation, was in robust health.

The indications for excisions of the rib have been formulated by M. Demarquay as follows: First, when a foreign body is impacted in a rib; secondly, in some forms of fracture of the rib; thirdly, in cases of caries and necrosis; fourthly, in cases of cancer or tumors.[1] The first indication would present itself when arrow-heads are impacted in the ribs;[2] or the points of knives or swords are broken off in the shafts of ribs; or when a pistol or musket ball is imbedded and cannot be extracted by forceps or screw. Thus, Malle,[3] in 1843, removed a broken knife-blade, impacted in the right fifth rib, including the foreign body, with a portion of the rib, in the crown of a trephine.

In compound comminuted fractures, the circumstances of each case must determine the necessity and extent of surgical interference. It will be always proper to remove detached fragments of bone, even if driven into the lung tissue, and it may be necessary to saw off the splintered ends of the ribs. Yet when points of the inner lamina, still covered by periosteum, are bent inward, it may be safer to replace them by traction with a lenticular, hoping for consolidation, and preferring always that mode of dressing involving the least hazard of injuring the pleura; which will sometimes incur greater risk from the presence of the fractured ends, and in other cases from the operation for their removal.[4]

In cases of caries and necrosis, there is less difficulty in deciding when an operation is opportune and far greater facility in its performance; for the pleura in these cases is usually thickened and separated from the rib.[5] The operations for tumors may present formidable difficulties; but need not be considered here.[6]

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[1] M. DEMARQUAY (*Gaz. Méd. de Paris*, T. XXIV, p. 30, 1869). I cite M. Demarquay as the latest author who has treated the subject systematically. Dr. F. H. Hamilton (*Principles and Practice of Surgery*, 1872, p. 266) proposes another indication: "To exseet a portion of the rib in order to reach and secure the bleeding vessel" in some cases of hæmorrhage from the intercostal artery, which is, I think, inadmissible.

[2] See *Report of Surgical Cases, etc.*, Circular No. 3, S. G. O., 1871, p. 160, for illustrations of this form of injury, and specimens 4735, 4736, and 4823 of the Army Medical Museum.

[3] MALLE (*Traité d' Anatomie Chirurgicale et de Médecine Opératoire*, Paris), 1855, p. 660. M. Malle observes justly that Heine's osteotome is a preferable instrument for such operations, but this is a very expensive instrument, rarely made except for the armamentaria of public institutions. Medical officers should know that there is one, which they are at liberty to use, in the collection of instruments at this Office.

[4] DUVERNEY (*Traité des Maladies des Os*), BÖTTCHER (*Auswahl. d. Chir. Verhandes*, Berlin, 1795), GOULARD (*Œuvres de Chirurgie*, Pizenas, 1766), CALLISEN (*Systema. Chirurg. Hod. Hajniæ*, 1788) writes on this class of cases. ROUX reports a case in the *Examinateur Médical*, Vol. I, p. 122. A full collection of cases is made by JÆGER, *Handwörterbuch der gesammten Chirurgie*, Leipsig, 1839, Art. *Resectio ossium*, B. V., S. 424.

[5] Dr. WILLIAM A. MCDOWELL, of Fincastle, Virginia, was one of the first in this country to excise considerable portions of necrosed ribs. He describes in his *Dissertation on the Pathology of the Bones* (*Am. Med. Recorder*, Vol. XIII, p. 119), the extraordinary operation he successfully performed June 25th, 1827, for the removal of the greater part of the right sixth and seventh ribs. At that time the operation by RICHERAND (the account is translated in the *Medical Repository*, New York, 1818, Vol. IV, p. 401), and that of CITTADINI (*Annali univ. di Medicina*, Milano, Marzo, 1826; but published in the *Journal complementaires* of the great dictionary in sixty volumes, in 1820) were about the only instances of this operation mentioned in the current surgical literature. Cittadini removed only the sternal extremity of the first rib, necrosed in consequence of the impaction of a stiletto point. He divided the cartilage with a probe-pointed knife, and the rib by cutting forceps.

[6] Consult Professor S. D. GROSS's *System of Surgery*, 5th ed., Vol. II, p. 1080. M. DEMARQUAY, Article *Côtes*, in the *Nouveau Dictionnaire de Médicine et de Chirurgie Pratiques*, Paris, 1869, T. IX, p. 589, and the amplification of this article in a dissertation entitled *Résection des côtes* in the *Gazette Médicale de Paris*, 3ème Série, T. XXIV, pp. 29, 56; PERCY'S Article *Résections*, in the *Dict. des Sci Méd.*, T. XLVII, p. 550; RIVERIUS, *Observationes Medicarum Centuriæ Quatuor*, Lugduni, 1763, p. 129; Communicated observation by A. D. OZIA AIMAR, a most celebrated surgeon of Gratianopolis (Grenoble), Obs. III, relating to *Dominus de Bessin*, a contusion with extensive caries of the ribs, that had been treated by the actual cautery, until an opening into the thorax was produced that would admit the hand. Aimar removed four fingers' breadths from the carious ribs, and

Excisions of Portions of the Sternum.—Trephining of the manubrium and gladiolus, which should be legitimately classed with excisions, has been recommended in cases of necrosis, and compound fracture of the bone, and to facilitate ligation of the internal mammary, and the extraction of foreign bodies from the anterior mediastinum. De la Martinière laid down rules for trepanning the sternum (*Mém. de l'Acad. de Chir.*, 1819, T. IV, p. 488); but Percy tells us (*Chirurg. d'Armée*, p. 123) that Purman was the first who performed the operation, and remarks naively that when a ball is lodged in the duplicature of the mediastinum, "ce seroit effectivement l'unique ressource dans cette conjoncture. Mais il faudroit auparavant être bien sûr qu'elle y fut, et on sait combien à cet égard les signes sont décevans." A number of examples have been given of gunshot fractures of the sternum, laying open the mediastinal cavity so that the pulsations of the aorta and the heart were exposed. Conspicuous among these is the fortunate case of Private Betts (PLATE X, *opp.* p. 486). Dr. Judson's case of ligation of the internal mammary (p. 548) after gunshot fracture of the manubrium and second rib, illustrated by the interesting specimen, No. 2925, of the Surgical Series of the Museum; and the case observed by Dr. McGill (Powers, p. 535), in which the movements of the heart could be seen and felt through a perforation of the gladiolus, will also be remembered by the reader, and will recall the case described by Galen,* and that of the son of the Viscount of Montgomery, which afforded the immortal Harvey the occasion to demonstrate to His Serene Majesty Charles II the movements and the insensibility of the heart.†

obtained a sound cicatrix. Demarquay says that *Cerœus*, in the sixteenth century, was regarded as the author of the operation of resection of carious ribs. I do not find this name among the authors of the sixteenth century. Androuet *Cereeau* (1576) wrote on architecture, and J. A. *Cerceau*, the only other of the name known to bibliophiles, was a French jesuit, who, in the next century, wrote verses "of mediocre quality," according to Voltaire. But M. A. Severinus advocated the excision of carious ribs, in the sixth book of his *Synopseos Chirurgiæ*, Amsterdam, 1664, p. 135, and cites Galen, Celsus, and Paul of Ægina, without misleading Champion, who, in 1815, published a thesis entitled *Résections des os cariés dans leur continuité* (from which M. Demarquay complains that writers have quoted without acknowledgment), and duly cites Galen (*Methodus medendi*, l. v. ch. 8), Celsus (*de Re Med.* l. viii, c. 2) and Soranus, of Ephesus, in the twelfth chapter of the collection made in the eleventh century by Nicetas, of Constantinople. Paul of Ægina (See Syd. ed. translation, Vol. II, p. 453), after preserving the dregs of the Arabs in the honey of his Saronic Greek, has fared as badly as Champion at the hands of the plagiarists. Other observations of excisions of portions of necrosed ribs may be found in A. SCHENKIUS, *De Vuln. thorac., Obs. medicinalium*, Frankfurti, 1665, L. II, p. 297; LEVACHER, in the *Mercure de France*, April, 1858. RICHERAND's famous case is printed in the *Bulletin de la Faculté*, T. VI. ROUX, wrote on the subject in 1802, in his treatise *De la Résect. on du Retranch. des os malades.* MOREAU describes examples in his two essays, 1803 and 1815. See also CITTADINI, *De la résect. des côtes* (in Arch. Gén. de Méd., 1828, T. XVIII, p. 71); CLOT BEY, for two cases (*Jour. Heb.* 1825); BLANDIN, *Necrose d'un côte* (Gaz. des Hôp., 1840, p. 373); FIORI, *Résection de la totalité d'une côte* (Gaz. des Hôp, 1842, p. 518, from *Annali univ. di Milano*); HEYFELDER (*op. cit.*, Bœckel's ed. p. 236); LARGHI (*Operazioni sotto-periostee e sotto-capsulari*, Torino, 1855. Professor Gross refers to a remarkable excision of the necrosed shafts of the sixth and seventh ribs, which he performed at the Jefferson College clinic, in 1857; and cites the extraordinary exploits by Suif (*Bernardus Suevus?* in Haller) and Dr. Milton Antony, of Georgia (it is illustrated by a plate in the *Phil. Jour. of Med. and Phys. Sci.*, Vol. VI, p. 108), and the formidable operations by John C. Warren, George McClellan, and William Gibson. Warren's two cases are printed in the *Boston Med. and Surg. Jour.*, Vol. XVI, p. 201, 1837; George McClellan's case was published in the *Western Jour. of Med. and Phys. Sci.*, Vol. IV, p. 479, 1831, and Dr. J. H. B. McClellan related its later history in the *Med. Examiner*, N. S. Vol. VI, p. 75, 1850.

* Galen gives the *Historia pueri persanati, cui os pectoris excisum erat*, in his work *de Anatomicis Administrationibus.* It may be found in the Latin version commented by Vesalius, Liber VI, Cap. 13, in the *Opera omnia*, Tomus I, of the Basil edition of 1562, as follows: "Quoniam vero semel curati pueri mentionem feci, nihil mali fuerit omnia, quæ ipsi cuenerut, percensere. Nam propter historiæ utilitatem, etiam si ad præsens opus nihil attineat, nō abs re fuerit ea commemoræ. Ictus puer ille in pectoris osse in palæstra neglectus primum est, deinde parum probe curatus post menses quatuor pus in parte percussa apparuit hoc auferre cogitans medicus puerum incidit, an, ut putabat, subito ad cicatricem vulnus perduxit postea rursus inflammatio oborta est, mox quoque abscessus iterum sectus puer est, nec amplius cicatrix obduci potuit. Quapropter herus ipsius pluribus medicis convocatis, inter quos ego quoque eram, deliberare super curatione pueri iussit. Cum autem sideratio quam Greci σφάκελη appellant, pectoris ossis affectus videretur omnibus, appareret autē & cordis à sinistra ipsius parte motus memo affectum os excidere audebat: quippe arbitrabantur thoracis perforationem necessario futuram. Ego autem citra vocatam proprie à medicis perforationem adhibitā, pollicitus sum me excisurum, de absoluta vero curatione nihil promisi: cum incertum esset, num aliquid ex iis quæ pectoris ossi subiacent, fuerit affectu, & quatenus affectu. itaque regione detecta amplius nihil in pectoris osse lesum apparuit, atque quod ab initio statim videbamus: quare etiam magis ad manus operationem venire sum ausus: cum iam fines, quibus arteriæ, & venæ subhærescunt utrinque illæsi occurrissent. Cum vero affectum os ab eo potissimū loco excidissem, in quo talis pericardii vertex ad nascitur cumque nudum cor appareret (quippe involuerū ipsius computruerat), ob hoc quidē haud bonam statim spem de puero habebam, attamen in totū brevi teporis spacio persanatus est, quod non accidisset si nemo affectum os abscindere ausus fuisset. nemo aut tentasset nisi in administrationibus anaticomicis præexercitatus. Alius quidam eodem tempore putrificum vitium ex humorum decubitu in brachio subsecans, insignem arteriam particularum membri ignorantia divisit: subitoque ob sanguinis profluvium conturbatus est, & cum vix laqueo ipsam posset intercipere (erat enim profundior) repente quidē ex sanguinis fluore periculum repulit, sed aliaratione hominem jugulavit, gangræna videlicet propter laqueum occupāte anteriam maxime, & primū deinde omnia ipsi circundata. Hæc igitur ex multis pauca obiter dicta sunt, quæ cordatis lectoribus præsentis commentarii utilitatem indicant."

† The account is printed, as though lost or estrayed. as La Martinière observes, at page 208, *Ex.* LII of the *Exercitationes de Generatione Animalium*, Lugduni, ed. Nov., apud Kerkhem, 1737. The following is the translation of Willis, (Syd. Soc., ed. 1847, p. 382): "A young nobleman, eldest son of the Viscount Montgomery, when a child, had a severe fall, attended with fracture of the ribs of the left side. The consequence of this was a suppurating abscess, which went on discharging abundantly for a long time, from an immense gap in his side; this I had from himself and other credible persons who were witnesses. Between the 18th and 19th years of his age, this young nobleman, having traveled through France

Operations on the sternum during the war appear to have been limited to the removal of broken fragments at the primary dressing of gunshot fractures involving this part, and the extraction of small necrosed pieces. Fractures, on account of the spongy texture of the bone, and the support it receives from its strong *fascia propria*, were usually unattended with much comminution. A number of examples have been cited of the more important cases that came under treatment.* The two following abstracts refer to interesting specimens in the Museum:

CASE.—Private John M., Co. F, 34th New York Volunteers, received a perforating gunshot wound of the chest at Fair Oaks, Virginia, May 31, 1862. The missile entered at the junction of the third and fourth ribs with the costal cartilage on the left side and escaped at a corresponding spot on the right side. He was admitted, on June 4th, to the Balfour Hospital at Portsmouth, Virginia. There was hæmoptysis, cough, and spasmodic pain, with dyspnœa upon any emotion. He died June 28, 1864. At the necropsy, the posterior periosteum was found to be uninjured, although the sternum was fractured. A slight adhesion was found on the right side. The pathological preparation from this case is specimen No. 4933, section I, A. M. M., consisting of two portions of the sternum, and exhibiting a fracture of the gladiolus. It was contributed, with notes, by Assistant Surgeon William Thomson, U. S. A.

CASE.—Private John McC., Co. B, 56th New York Volunteers, aged 26 years, was admitted to the Balfour Hospital at Portsmouth, Virginia, June 4, 1862, with a gunshot-perforating wound of the chest received at Fair Oaks on May 31st. The ball entered the posterior fold of the left axilla and escaped at the junction of the right third rib with the sternum. The patient had the usual symptoms of traumatic pleuro-pneumonia. He died June 25, 1862. At the necropsy, it was discovered that scarcely a vestige of the left lung remained. The left pleural cavity contained pus. An ecchymosis was found upon the arch of aorta. Specimen No. 4934, Sect. I, A. M. M., is the upper half of the sternum and exhibits a gunshot fracture of the second piece of the gladiolus most conspicuous on the posterior or inner surface. The articulation between the manubrium and first piece of the gladiolus is obliterated by ossification. The fracture is attended by disjunction of the second and third pieces; the third suture still exists. The preparation was contributed with a memorandum by Assistant Surgeon William Thomson, U. S. A., who remarks that the interest of the case resides mainly in the long continuance of life (three weeks), with such an injury.

The mortality of gunshot fractures of the sternum, that came under treatment, was not very great. Of fifty-one cases, only eighteen, or 35.3 per cent., terminated fatally. This coincides with the conclusions of Dr. Oscar Heyfelder (*op. cit.*, p. 241), who has collected seventeen instances of partial excision of the sternum, with only one fatal result:†

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and Italy, came to London, having at this time a very large open cavity in his side, through which the lungs, as it was believed, could both be seen and touched. When this circumstance was told as something miraculous to His Serene Majesty King Charles, he straightway sent me to wait on the young man, that I might ascertain the true state of the case. And what did I find? A young man, well grown, of good complexion, and apparently possessed of an excellent constitution, so that I thought the whole story must be a fable. Having saluted him according to custom, however, and informed him of the king's expressed desire that I should wait upon him, he immediately showed me everything, and laid open his left side for my inspection, by removing a plate which he wore there by way of defence against accidental blows and other external injuries. I found a large open space in the chest, into which I could readily introduce three of my fingers and my thumb; which done, I straightway perceived a certain protuberant fleshy part, affected with an alternating extrusive and intrusive movement; this part I touched gently. Amazed with the novelty of such a state, I examined everything again and again, and, when I had satisfied myself, I saw that it was a case of old and extensive ulcer, beyond the reach of art, but brought by a miracle to a kind of cure, the interior being invested with a membrane and the edges protected with a tough skin. But the fleshy part (which I at first sight took for a mass of granulations, and others had always regarded as a portion of the lung)—from its pulsating motions and the rhythm they observed with the pulse when the fingers of one of my hands were applied to it, those of the other to the artery at the wrist, as well as from their discordance with the respiratory movements—I saw was no portion of the lung that I was handling, but the apex of the heart! covered over with a layer of fungous flesh by way of external defence, as commonly happens in old foul ulcers. The servant of this young man was in the habit daily of cleansing the cavity from its accumulated sordes by means of injection of tepid water; after which the plate was applied, and, with this in its place, the young man felt adequate to any exercise or expedition, and in short he led a pleasant life in perfect safety. Instead of a verbal answer, therefore, I carried the young man himself to the king, that his majesty might with his own eyes behold this wonderful case: that, in a man alive and well, he might, without detriment to the individual, observe the movement of the heart, and with his proper hand even touch the ventricles as they contracted. And his most excellent majesty, as well as myself, acknowledged that the heart was without the sense of touch; for the youth never knew when we touched his heart, except by the sight or the sensation he had through the external integument. We also particularly observed the movements of the heart, viz: that in the diastole it was retracted and withdrawn, whilst in the systole it emerged and protruded, and the systole of the heart took place at the moment the diastole or pulse in the wrist was perceived; to conclude, the heart struck the walls of the chest, and became prominent at the time it bounded upward and underwent contraction on itself."

* See pages 486, 487, 488, 504, 523, 526, 535, 548.

† M. Hippolyte Larrey, in his lectures on surgery at Val-de-Grace, ascribes the frequent occurrence of necrosis of the sternum to the pressure of the soldier's cross-belts. Such an effect has not been observed frequently in the United States service. M. Linoli has resected the xiphoid appendage (*Annali univ. di medicina di Milano*, 1851) for obstinate vomiting. It has been affirmed by Percy that the xiphoid cartilage will sometimes recede before a ball and then spring back barring the opening, as observed by Guillemeau (*Œuvres de Chirurgie*, Rouen, 1649) in the case of M. de Malécorne. If the sternum is very soft, it will not bear readily the pressure of the trephine or osteotome, and it will be necessary to resort to the chisel or gouge, as Boyer did, or the chain saw, as employed by Dr. J. F. Heyfelder. Moreau, Blandin, Jæger, and Kuchler removed diseased costal cartilages in their operations for partial excisions of the sternum. See JÆGER, *Handwörterbuch der gesammten Chirurgie*, B. V, S. 425, Leipsig, 1839; SKIELDERUP, *On the Operation of Trepanning the Sternum*, translated from the Transactions of the Royal Society of Copenhagen, 1813, in *Am. Med. Repository* N. S., 1820, Vol. V, p. 273; FERGUSSON, *Syst. of Pract. Surgery*, 5th ed., 1870, p. 620; HOPTON, *Operation of the Trephine for the Removal of a Portion of Carious Sternum*, *Am. Jour. Med. Sci.*, Vol V, p. 45, 1829; and among older authors, COLOSSIUS, *De perforatione ossis pectoralis*, Tübingen, 1775; BÖTTCHER, *Abhandlungen v. d. Krankheit d. Knochen*, T. I, S. III, Dessau, 1781; BRANDES, *De Pectoris Paracentesi*, Gœttingen, 1792; J. L. PETIT, *Trait. de mal. chir.*, already cited, 1774, T. I, p. 76.

Thoracentesis.—This operation was occasionally resorted to during the war to relieve the effects of effusions resulting from acute and chronic pleurisy; and, more frequently, on account of effusions consequent on traumatic pleuro-pneumonia, or the lodgement of foreign bodies within the chest. The instances that are not classified under other headings will be enumerated here.

In the eight following cases, paracentesis of the thorax was practiced on account of hydrothorax or empyema unconnected with any wound of the chest:

Case 1.—Private John Vaughan, Co. B, 3d battalion, 12th United States Infantry, aged 22 years, was admitted to the Post Hospital, Washington, May 30th, 1866, suffering from chronic pleurisy of the left side, with extensive effusion. By June 28th, the effusion extended over an inch above the left nipple. Good nourishing food, mercurial inunction, and mild diuretics had produced no diminution of the abdominal fluid. The patient's appetite was good; he slept soundly, and was able to walk about, and felt but little inconvenience. Assistant Surgeon William Thomson, U. S. A, performed paracentesis thoracis with a silver trocar above the ninth rib, near the inferior angle of the scapula, through valvular opening. Twenty-one ounces of albuminous serum were removed, after which the wound was hermetically closed. The operation was repeated July 16th, August 7th, and September 22d, giving but transitory relief. He was returned to duty October 16th, 1866. Not a pensioner.

Case 2.—Private Martin Carbit, Co. B, 18th United States Infantry, aged 23 years, was admitted to hospital at Camp Dennison, June 24th, 1864, suffering from empyema of left side. The symptoms present were an entire absence of the respiratory murmur of the affected side, with bronchial respiration, and protrusion of the intercostal spaces; fixedness of the thoracic parietes; tenderness on pressure of the intercostal spaces; dullness on percussion, and increased circumference of the side, relative to the normal circumference of the other. There was also a small opening between the second and third costal cartilages at their junction with the sternum. On August 26th, the patient was very weak and life was fast ebbing away. His appetite was poor, and he suffered from diarrhœa, fever, and great dyspnœa. Acting Assistant Surgeon A. Buckingham introduced a canula between the sixth and seventh ribs; about one quart of thick pus of a very offensive odor flowed away. The operation was repeated on August 28th and 30th and on September 1st, 3d, and 5th, the same quantity being drawn off each time, the pus becoming thinner. Stimulants and tonics, with good, nourishing diet, were administered. The side collapsed considerably, and the patient's strength improved rapidly. He was discharged from service September 6th, 1864. Not a pensioner.

Case 3.—Private John H. Miller, Co. L, 17th Illinois Cavalry, aged 20 years, was admitted to Marine Hospital, Chicago, Illinois, April 4th, 1864, with incipient phthisis and pleurisy, with effusion. Great dyspnœa and cyanosis occurred On June 29th, Acting Assistant Surgeon Ralph N. Isham performed thoracocentesis. July 4th, patient walking about. Discharged from service July 28th, 1864. Not a pensioner.

In the two following cases, metastatic abscesses and empyema appear to have resulted as pyæmic complications after excision or amputation for gunshot injuries of the extremity. There was no primary injury of the chest in either case:

Case 4.—Private Robert Bivens, Co. E, 115th Illinois Volunteers, aged 20 years, was wounded at Chickamauga, Georgia, September 20th, 1863, by a musket ball, which passed directly through the right elbow-joint. On September 26th, Surgeon William Varian, U. S. V., administered chloroform and excised a portion of the right ulna and the inner condyle of the humerus. Simple dressings were applied, and tonics and stimulants, with nourishing diet, were administered. In February, 1864, inflammation of the lungs supervened, with formation of abscesses, for which paracentesis thoracis was performed by Dr. Moore, of Decatur, Illinois. The patient was discharged from service March 23d, 1865, on surgeon's certificate of disability. Examining Surgeon Isa B. Curtis, Decatur, Illinois, August 14th, 1866, reports: "Gunshot wound through arm near elbow-joint. There has been resection at the joint. Joint was perfectly anchylosed, and the wound still discharging at both orifices. Flexal at right angle. Limb much emaciated and useless. General health poor, result of said wound, owing to the constant drain on the constitution. He was still a pensioner in March, 1872."

Case 5.—Private Seth T. Reynolds, Co. G, 4th Indiana Cavalry, aged 22 years, was admitted to Hospital No. 1, Nashville, September 3d, 1864, with a gunshot fracture of the three middle toes of the right foot and the metatarsal bone of the little toe of the left foot, received, accidentally, at Nashville on the same day. Acting Assistant Surgeon M. L. Herr, administered chloroform and removed the three toes of the right foot near the metatarsal phalangeal articulation, and also excised the fifth metatarsal bone of the left foot. On November 1st, 1864, Dr. Herr performed paracentesis thoracis of the left side of the chest between the sixth and seventh ribs, one fourth the distance from the spinal column to the sternum. Twenty ounces of pus were removed. The patient improved rapidly under the administration of tonics, stimulants, and nutritious diet, and, on December 21st, was transferred to Crittenden Hospital, Louisville; on June 10th, 1865, to Brown Hospital, whence he was returned to duty, probably to be mustered out, June 14th, 1865. Surgeon B. B. Breed, U. S. V., reports the case.

Three of the eight cases, in which tapping was resorted to on account of the results of idiopathic pleurisy, terminated fatally:

Case 6.—Private John Robinson, Co. G., 112th Pennsylvania Volunteers, aged 20 years, was admitted to Convalescent Hospital, Philadelphia, February 24th, 1864, suffering from pleurisy of the right side, with effusion. By March 12th, the right

thorax had become perfectly flat on percussion. No respiratory murmur could be heard. The superficial veins were distended and could be seen crossing over the surface. The intercostal surfaces were also distended. The patient was in a sinking condition from want of due aëration of the blood. Pulse 132; respiration 48 per minute. Acting Assistant Surgeon A. D. Hall performed paracentesis thoracis, with bistoury and trocar between the sixth and seventh ribs, anteriorly, at the angle of the thorax. Twenty-four ounces of clear straw-colored serum were evacuated, when the flow was stopped, as the patient appeared exhausted. The dyspnœa was much relieved, but the patient was so utterly prostrated that he continued to sink. The treatment, which had at first been especially directed to the chest, was at a later period changed to supporting and stimulating. Death resulted March 13th, 1864. At the necropsy the right chest was found to contain twenty-four ounces of bloody serum. The right lung was compressed against the spine. The whole cavity was lined with thick, false membranes, and soft bridles of the same traversed the cavity in every direction. The upper lobe was consolidated. The left lung was merely hypostatically congested—floating in water. The wound of operation in the parietes of the right chest had healed over, making it difficult to be found on the inside. The heart was perfectly healthy.

Case 7.—Private William O. Martin, Co. E, 5th Michigan Cavalry, aged 19 years, was admitted to Jarvis Hospital, Baltimore, March 3d, 1865, suffering from pleurisy. Effusion and empyema supervened. On May 13th, the left pleural cavity was filled with a sero-purulent fluid, displacing the heart to the right side. Acting Assistant Surgeon H. McElderry performed paracentesis thoracis between the eighth and ninth ribs, on the left side; about two gallons of fluid were evacuated. Tonics and stimulants were administered. Death resulted May 27th, 1865.

Case 8.—Private Thomas Tigner, Co. E, 193d Ohio Volunteers, aged 17 years, was admitted to Jarvis Hospital, Baltimore, March 27th, 1865, suffering with pleurisy and empyema. By May 29th, 1865, the right pleural cavity was distended with fluid, and there was great dyspnœa. Acting Assistant Surgeon E. G. Waters performed paracentesis thoracis between the eighth and ninth ribs, on the right side; about one gallon of fluid was evacuated. The patient died June 22d, 1865.

No doubt many other cases are noted on the medical reports, the subject strictly pertaining to the domain of internal pathology, and being mentioned incidentally only on the surgical returns.*

In the nine following cases, thoracentesis was performed on account of effusions following the perforation of the chest by small projectiles:

Case 9.—Corporal *L. G. Klanbower*, Co. K, 1st Florida Regiment, was wounded at Mission Ridge, Tennessee, November 25th, 1863, by a musket ball, which entered above the spine of the right scapula, passed through the cavity of the chest, and emerged one inch below the sterno-clavicular articulation on the same side. He was taken prisoner and conveyed to Hospital No. 2, Chattanooga, December 8th. Anterior wound discharged daily; dullness over right lung in its whole extent; bulging of chest well marked. Percussion over left lung more resonant than natural. Upon forcibly distending the lung, about one pint of unhealthy pus was discharged from the anterior wound. Surgeon A. McMahon, 64th Ohio Volunteers, performed thoracentesis at the lower angle of the scapula and upper border of seventh rib, drawing off at least sixteen ounces of sero-purulent matter, extremely fetid, presenting somewhat the appearance of dirty soap-suds. Wound closed with scraped lint. Anterior and posterior wounds closed with lint, firmly covered with adhesive plaster. The patient felt relieved after the operation; the difficulty of breathing was not so great, but he was troubled with a short, dry, irritable cough. Stimulants were ordered freely. Death occurred on December 11th, 1863.

Case 10.—Private George W. Sawyer, Co A, 1st Michigan Sharp-shooters, was wounded at the Wilderness, Virginia, May 5th, 1864, by a conoidal ball, which entered a little below and to the right of the right nipple, passed through the lung, and emerged just to the right of the spine; the same ball also passed through the right arm. On June 14th, he was admitted to the Third Division Hospital, Alexandria. Pleurisy and empyema supervened, and on January 25th, 1865, Assistant Surgeon W. G. Elliott, U. S. V., performed paracentesis thoracis. Tonics, stimulants, and nutritious diet were administered. The case progressed favorably, and, on June 25th, the patient was transferred to Harper Hospital, Detroit, Michigan, whence he was discharged from service July 21st, 1865. Pension Examiner J. W. Falley reports, September 1st, 1865, "the wound of entrance is still discharging. He is able to walk about the house." Sawyer died July 30th, 1866.

Case 11.—Private Owen Morrison, Co. I, 1st Ohio Volunteers, aged 22 years, received a gunshot wound of the neck and right shoulder by a conoidal ball at Resaca, Georgia, May 14th, 1864. He was treated in the field, and, on May 27th, was transferred to Hospital No. 1, Nashville, Tennessee. By June 17th, the patient was exhausted by coughing and labored respiration, and the suffocation caused by a large collection of fluid in the chest. The intercostal spaces over the right side were obliterated, and the left lung was highly inflamed. Acting Assistant Surgeon H. C. May performed paracentesis thoracis of the right side of the chest, between the sixth and seventh ribs, five inches from the sternum. Ninety-three ounces of sero-purulent fluid were drawn off. The removal of the fluid gave temporary relief. Air reëntered the collapsed lung. Tonics, stimulants, and nutritious diet were administered. The patient died June 17th, 1864, from exhaustion.

* The subject of thoracocentesis in the effusions of acute pleurisy has recently (April, 1872) been discussed at the Academy of Medicine of Paris, at great length. Professor Béhier, in a memoir in which he claimed that the popularization of tracheotomy in croup and thoracentesis in pleurisy were the two greatest of Trousseau's great titles to the grateful homage of the profession, supported the views advocated in the *Clinique Médicale de l'Hôtel-Dieu*, by sixteen carefully observed cases, which he thought demonstrated the innocuity of "capillary thoracocentesis" with an aspirater providing against the admission of air. Many of the academicians joined in the exhaustive and somewhat acrimonious debate that followed, among them a few that had participated in the similar discussions of 1835 and 1865, among them MM. Guérin, Sédillot, Richet, Chassaignac, Roger, and Hérard.

Case 12.—Captain Prosper Dalien, Co. C, 208th Pennsylvania Volunteers, aged 26 years, was wounded at Petersburg, March 25th, 1865, by a conoidal ball, which entered beneath the inferior angle of the left scapula, passed through the pleura, and emerged at the anterior superior border of the left axillary space. He was treated in the field hospital of the Ninth Corps, until April 24th, when he was transferred to Armory Square Hospital, Washington. When admitted, there was considerable dyspnœa, with excessive pain, which was increased by coughing. At each forcible expiration the air was expelled from the wound of the back. Stimulants and anodynes were given. Whenever the patient moved he complained of a gurgling sensation. On percussion in the recumbent and upright position, it was decided that there was a large quantity of pus in the thoracic cavity. The cavity was opened by Assistant Surgeon Charles A. Leale, U. S. V., and twelve ounces of pure pus withdrawn, by means of a Flint's evacuator. Air was forced from the thoracic cavity through the wound in the arm. Morphine given to allay pain. On June 2d, hæmorrhage occurred from the cavity near the axillary space, and the patient died on the same day.

Case 13.—Private John C. Burk, Co. B, 5th United States Cavalry, aged 28 years, was wounded at Manassas Gap, July 21st, 1863, by a ball, which entered the left side of the body better than half way between sternum and side, between sixth and seventh ribs, passing backwards and upwards, emerging just below the outer and inferior angle of the left scapula, injuring the left lung. There was considerable hæmorrhage at time of injury. He was admitted into Lincoln Hospital, Washington, D. C., on July 30th, 1863, when vesicular murmur was heard over upper portion of lung; dull over lower; but over region of wound, loud crackling; air rushing in and out during respiration; pulse, 84; tongue somewhat flabby and furred; bowels, costive; no passage for nine days. On August 21st, after consultation, paracentesis thoracis was performed by Assistant Surgeon H. Allen, between the sixth and seventh ribs; no pus escaped. Patient improved until September 8th, after which he grew worse, suffering from pain in chest, and failing rapidly; continually calling for water, but refusing food and medicine. He died on September 11, 1863. *Post mortem* nineteen hours after death; rigidity well marked; not much emaciated; parts *in situ;* right lung barely visible; left lung bound anteriorly to costal pleura, a little behind the junction of the cartilages in the ribs, extending from the clavicle to the fourth rib. Behind and below it, was a collection of pus measuring thirty-six fluid ounces and six drachms. The pleura everywhere was covered with a thick layer of lymph; a small sac was found between the internal portion of the lung and the pericardium, filled with a straw colored limpid serum. Position of heart somewhat deviated, the apex being in the median line on a level with the fifth rib, the left side of the heart being parallel with the median line, the right side being thrown much beyond it, encroaching considerably on the right thoracic cavity. The left lobe of the liver extended three inches to the left of the median line; the free margin of the right lobe extended down within an inch of the umbilicus. The fundus of the stomach was seen beneath the left lobe. Intestines, normal; a few fibrinous threads were present; omentum not visible; œsophagus of dark purple color; mucous membrane firm; trachea purplish; contained a small quantity of viscid mucus. Bronchial glands enlarged and blackened 1st lobe of right lung; pigmentary matter abundant externally, parenchyma of a darkish red color, paler toward the surface; permeated everywhere with air, and a large quantity of thin frothy matter exuded on pressure. On the second lobe was a conspicuous depressed puckered spot on its anterior surface, which, upon examination proved to be calcareous deposit. Third lobe intensely congested, being of a deep dark reddish color; veins filled with clotted blood, and the same character of bronchial secretion as seen in the first lobe. Left lung much collapsed, being a little over an inch in thickness; much compressed; of a dull mahogany color, and not permeated with air, except the anterior median portion. Right lung weighed nineteen ounces; left lung weighed twenty-two ounces. Heart measured three and a quarter inches in width and four inches long; right auricle contained a small quantity of venous blood, which was entangled in soft clots in the meshes of the tricuspid valve, particularly at the base, and a firm fibrinous clot ran through the auricle into the ventricle, thence up into the pulmonary artery, the valves of which were healthy. The left side of the heart contained no clot; a small quantity of blackish fluid was seen at the base of the ventricle; the organ was perfectly healthy, and weighed ten and a half ounces. Pericardial fluid, twenty-six drachms, of a turbid yellowish color, turbid with lymph. Liver measured twelve by ten inches, and four and a half inches thick; weighed ninety-five and a half ounces; bile, one drachm; of a dark sienna brown color, very viscid, semi opaque; liver perfectly healthy. Spleen, six inches long by three and a half inches wide; of a darkish mahogany color externally and internally; weight, twelve ounces. Right kidney, five inches long by three wide; of a dark purple color throughout; pyramidal bodies of a lighter color than the cortical, especially at their apices. Left kidney, five and a half inches long by two and a half wide; similar in appearance to the opposite kidney; right weighed seven and three-quarter ounces; left, eight and a quarter ounces. Pancreas weighed four and a quarter ounces, ten inches long by two and a quarter inches across head. Brain, membranes healthy; quantity of fluid in the ventricles inappreciable; organ, firm and healthy; weight, forty-eight ounces. Intestines, perfectly healthy. The ball entered in the back two inches below the spine of the scapula, and four inches from the vertebræ, making its exit eight and a half inches below the coracoid process between the seventh and eighth ribs of the left side. The case is reported by the operator, Assistant Surgeon H. Allen, U. S. A,

The following case of perforation of both lungs by a pistol ball, presented the complications of hæmothorax, emphysema, and tromatopnœa, and is interesting as one of the few instances, if not the only one, reported during the war, of lumbar ecchymosis as a sign of chest wounds:*

Case 14.—Corporal Samuel A. C———, Co. E, 1st United States Cavalry, aged 20 years, was wounded in a cavalry charge near Culpeper, Virginia, August 1st, 1863; the missile, a revolver ball, entered the back, left side, about two and a

* There has been a general disbelief among the military surgeons with whom I have conversed or corresponded, in regard to the diagnostic value of this sign of wound of the thorax, and having never observed the phenomenon in question, I have shared in this incredulity. Chaussier and Malgaigne contested the possibility of the transudation of blood through the pleura during life; but admitted the existence of the lumbar ecchymosis described by Valentin, and ascribed it to the infiltration of blood into the cellular tissue through the external wound. M. Legouest, in the last edition of his *Chirurgie d'Armée*, page 352, says: "Ce symptôme, que nous avons eu l'occasion de constater, est sans importance, et son apparition, toujours tardive, s'ajoute rien au diagnostic suffissamment élucidé par le réunion d'un certain nombre des symptômes que nous avons exposés." I had concurred in the

half inches below the spine of the scapula, above the posterior margin of the arm-pit, by the teres muscles, and was found beneath the skin to the right of the sternum, beneath the fourth and fifth ribs. He rode about a mile and then fainted. The hæmorrhage was considerable and he also vomited a little. Cold applications were applied and the patient was conveyed to Washington, entering Douglas Hospital on the next day. On admission, there was extensive emphysema and distressing dyspnœa, the patient breathing with a peculiar puff of the mouth at every expiration. He complained of pain in the left hypochondriac region, in the vicinity of the ball, which was immediately extracted by a perpendicular incision an inch in length. The wound of incision for the exit of the ball immediately gave rise to traumatic dyspnœa until it was closed with straps of isinglass plaster covered with collodion. The patient stated that he had considerable hæmoptysis, perhaps a cup half full, immediately after having been wounded. Small doses of antimony and calomel, with stimulants, were administered, and an anodyne given at night. August 3d: Vomiting; bowels costive. A grain of calomel was given, which opened the bowels. Dyspnœa considerably diminished, but still annoying; pain in left hypochondriac region during cough was allayed by the application of a mustard poultice; emphysema the same as on the day before. August 4th: Appetite good; patient somewhat more comfortable. On the 5th, the anterior wound was opened, which seemed to ease his respiration for a short time, but the distress in breathing soon returned. The patient recognized the extent of his injury and had no hopes of recovery. August 6th: The patient passed a tolerably good night; dyspnœa increased during the course of the day; emphysema in lumbar region; a mild cathartic was given; the cough became more troublesome and painful. The patient vomited a bilious green fluid, and during that act a "*paracentesis naturalis*" occurred by the violent explosion of the adhesive plaster from the anterior wound, followed by the discharge of a pint and a half of bloody serum and hot blood, which escaped particularly rapidly at each expiration and effort to cough. This escape of the bloody effusion in the thoracic cavity relieved him from the annoying dyspnœa, but weakened him in a great degree. Stimulants were administered freely, but he gradually sank; the arterialization of the blood could not take place; the blood became poisoned by carbonic acid, and he died of coma at 11 o'clock P. M., August 9th, 1863. A *post-mortem* examination was made ten hours after death. A strong, well-built, robust cadaver; excellent physique. Stiffness of death well marked. Emphysema all about the upper portion of the sternum and both sides of the chest. The back and left thigh were of a mulberry hue. The pistol ball had perforated the inferior edge of the shoulder-blade, just below the glenoid cavity and the infraspinatus and subscapularis muscles. It went into the left thoracic cavity, between the second and third ribs, and penetrated the anterior portion of the upper lobe of the left lung, and, extending across the chest above the blood vessels, entered the lower portion of the upper lobe of the right lung. A perpendicular incision one and a half inches obliquely upward from the right nipple, between the third and fourth ribs, an inch external to the sternum, represented the wound of exit. On removing the isinglass plaster which closed this wound, a considerable rush of air escaped. On careful dissection of the skin, the cervical, pectoral, and abdominal muscles were found largely infiltrated with blood, and there were clots of coagulated blood between the cellular tissues. The right lung was completely collapsed, caused by one-half gallon of blood in the pleural sac; nearly the same condition on the left side. Adhesion of both lungs to costal parietes indicated late pleurisy and the cause of former pain in that region. The heart and its appendages were normal. Paracentesis thoracis was performed between the eighth and ninth ribs on the right side, posteriorly, without injuring the lungs, and it gave exit to the enormous quantity of extravasated blood. The case is reported by Acting Assistant Surgeon Carlos Carvallo. The specimen, numbered 1680 in the surgical series of the Museum, is the left scapula, grooved just below the glenoid cavity. A fissure of one inch and a half, not connected with the direct wound of the ball, exists in the lower wing of the bone. The preparation and the notes of the case were contributed by Assistant Surgeon Wm. Thomson, U. S. A.

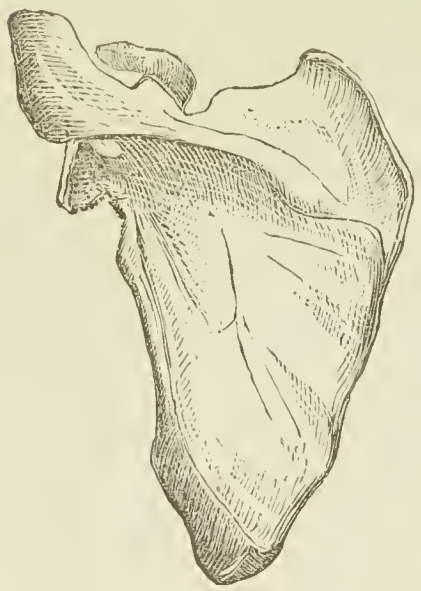

FIG. 274.—Left scapula perforated by a pistol ball. *Spec.* 1680, Sect. I, A. M. M.

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view expressed by Dr. Fraser, at page 87 of his often cited work, and supposed that this sign was admitted by surgical authorities chiefly through deference for the great name of Larrey. Dr. Fraser says: "The presence of the ecchymosis of blood in the loins * * which I never witnessed, although it is dwelt upon as certain evidence of effusion into the pleural cavity, by Valentin and others, * * * indeed, if it were not for the distinct statement made by Baron Larrey, at page 240, as to the presence of this peculiar discoloration, '*ce signe est l'un des plus pathognomoniques*,' I should consider this as one of many matters of romance, unthinkingly handed down by one writer to another." Larrey appears, however, to dwell more upon the œdematous engorgement, that Valentin also regarded as characteristic, than upon the ecchymotic discoloration. Here is the passage from the *Clinique Chirurgicale*, T. II, p. 240: "Enfin l'on aperçoit, ainsi que l'indique Valentin, *un engorgement œdémateux* plus ou moins étondu, avec ou sans ecchymose, derrière l'hypocondre correspondant à l'épanchement, *et ce signe est l'un des plus pathognomoniques.* Il se produit par une sorte d'infiltration séro-sanguine qui se fait du foyer de l'épanchement, à travers les membranes séreuses, les muscles intercostaux et dorsaux, les tissus cellulaire et dermoïde. *Nous avons constamment observé ce phénomène*, et nous avons plusieurs fois surpris la nature dans la marche de sa formation, c'est-a-dire qu'à l'ouverture des cadavres des personnes mortes de ces blessures avec épanchement, nous avons pu suivre l'infiltration sanguine depuis sa source jusque sous la peau." With this testimony, the subject would appear to demand further investigation. I will append one more citation from Valentin's rather rare book (*Recherches critiques sur la Chirurgie moderne*, Amsterdam, 1772, p. 72), that the nature of the signs he insisted on may be precisely understood: "Ces caractères ne se recontrent point dans l'échimose qui est le signe de l'épanchement de sang dans la poitrine: celle-ci en a d'autres qui lui sont absolument propres; dans quelque point de la circonférence de la poitrine que soit la plaie, cette échimose est tonjours située dans le même lieu, du côté où l'épanchement existe: elle se forme vers l'angle des fausses côtes: elle prend sa direction vers le carré des lombes; on l'observe souvent à la surface de ce muscle: sa couleur est la même que celle des taches qui paroissent au bas-ventre peu de tems après la mort, c'est à dire, d'un violet très éclairci; d'ailleurs ce signe ne se manifeste point dans le premier instant, on ne l'appecoit ordinairement que deux jours ou environ aprés l'accident; il est quelquefois plus longtems sans se rendre sensible. On conçoit aisément que l'on ne pent attribuer cette échimose qu'à l'infiltration du sang épanché; la partie la plus fluide de cette liqueur, apres avoir pénétré la plevre dans le point le plus déclive de la poitrine, échappe sans peine aux digitations que forment les attaches du diaphragme." "Ce n'est pas seulement dans les épanchemens de sang que l'on pent observer cette espèce de suintement de l'humeur contenue dans le poitrine; il a également lieu lorsqu'il se fait, dans cette cavité, un amas d'eau et de pus. Quoiqu'il n'entre point dans mon plan de traiter ici des signes de ces deux espèces d'épanchemens, cette seconde vérité vient si naturellement à l'appui de celle qué j'ai déja établie, elle est d'ailleurs si importante par elle-même, que je n'ai pas cru devoir la passer sous silence."—COMPILER.

Case 15.—Private Ellis Hulzizer, Co. G, 36th Illinois Volunteers, aged 18 years, was wounded at Dallas, Georgia, May 30th, 1864. The missile entered the left side, in front, passed through the pectoralis major muscle, near its tendinous portion, fractured a rib, perforated the thorax, and emerged behind, having perforated the scapula. He was at once conveyed to the hospital of the 2d division, Fourth Corps, where simple dressings were applied. On August 1st, he was admitted to Hospital No. 19, Nashville. The patient was irritable and prostrate, and suffered from fever, diarrhœa, and much emaciation. On August 15th, the wounds of entrance and exit were open, but being so high in the thorax there was a large amount of pus constantly accumulating in the pleural cavity, and it was deemed expedient to make an opening at a lower point to allow ready drainage. The lung was completely collapsed, and the discharge very offensive. Acting Assistant Surgeon Charles S. Merrill performed paracentesis thoracis, the opening being made between the sixth and seventh ribs. A tube was introduced and retained, the pleural cavity being cleansed, daily, with tepid water, followed by a weak solution of chlorinated soda for its stimulating and disinfectant qualities. Generous diet, with a liberal allowance of tonics and stimulants, was given, with vegetable astringents and opiates for diarrhœal discharges. Death resulted on November 2d, 1864, from exhaustion.

The three following of the series of nine perforations of the chest are reported as instances of partial recovery:

Case 16.—Captain Noah Bowman, Co. D, 142d Pennsylvania Volunteers, aged 28 years, was wounded at Petersburg, Virginia, April 1st, 1865, by a conoidal ball, which entered one-fourth of an inch to the left of the ensiform cartilage, passed beneath the ribs, through the right lung, and emerged at eighth rib, below axillary space. Hæmoptysis followed, which lasted for several hours. He was treated in the field hospital of the Fifth Corps until April 29th, when he was transferred to Armory Square Hospital, Washington. When admitted, the patient suffered greatly from dyspnœa; characteristic sputa of pneumonia; lower lobe of right lung collapsed; considerable febrile movement; great emaciation. May 6th: Upon a careful examination, the succussion sound was distinctly heard; the line noting the height at which the fluid stood, while the patient was in an upright position, was about two inches above the right nipple. As both wounds were closed, an incision, of a valvular nature, was made near the wound at eighth rib, and a No. 7 gum-elastic catheter introduced about four inches into the cavity, pointing downward, when, by means of a Davidson's syringe, sixty-eight ounces of pus and serum, having an exceedingly offensive odor, was withdrawn. The catheter was then removed and the integument held firmly over the opening by the atmospheric pressure, thereby preventing any ingress of air from without. Very little pain attended the operation, and the patient expressed himself as feeling greatly relieved. He improved rapidly in health, and, on May 26th, left for his home with good use of right lung and in an apparent condition for a complete and speedy recovery. He was discharged from service on June 1st, 1865. Pension Examiner Henry Brubaker reports, November 10th, 1865, that there is constant and free discharge of pus from the opening in the right side of the chest. The right lung is almost completely consolidated. He is entirely unable to leave his room. Greatly emaciated and debilitated. Still on the Pension List in 1872,—no improvement reported.

Case 17.—Sergeant Hiram H. Terwilliger. Co. E, 80th New York Volunteers, aged 29 years, was wounded at Bull Run, Virginia, August 30th, 1862, by a minié ball, which struck just below the calf, on the inner side of the left leg, and split upon the bone, one part passing through and issuing near its point of entrance; the other lodging on the outer side of the leg. This wound bled freely and occasioned considerable pain, but he kept his place, till, as he thinks, about a half hour later, when he was struck again by a round bullet on the left side; the missile passed directly through the cavity of the chest, grazing the lungs and liver, and emerged between the seventh and eighth ribs on the right side. It then entered the right arm and fractured the humerus into the elbow joint, where it lodged; the spiral nerve was injured. The first stunning sensation of the wound having passed, he left the field and walked a distance of about two miles, when, exhausted by loss of blood, he fainted. He was conveyed to Alexandria, and admitted, on September 1st, to Fairfax Street Hospital. On admission, he was insensible. Strong stimulants were administered. Acting Assistant Surgeon Robertson removed the half of the ball which had lodged in the leg; it was found flattened and ragged-edged. The case progressed favorably for about eight weeks, when the wound of the chest closed. This was followed by diarrhœa and feverishness, which symptoms passed off in a few days. His appetite and flesh returned, and he was discharged from service on January 14th, 1863. Soon after his arrival home, a cough set in, followed by severe pain in left side, disturbed sleep, impaired appetite, laborious breathing, swollen limbs, night sweats, and profuse expectoration. These symptoms becoming more and more aggravated, and evidence of pus in pleural cavity being well defined, the operation of thoracocentesis was performed by Dr. Smith Ely, of Newburgh, New York, on April 28th. A trocar was plunged into the cavity of the chest, just below the left shoulder blade, and an India-rubber tube inserted in the opening, the ends of which were left hanging down about four inches, the one within and the other on the outside of the chest. The operation was painful in the extreme, but, weak and emaciated as he was, he endured it without flinching. No anæsthetic could be administered, owing to his feeble condition. Through the syphon formed by the tube, there was discharged, during the ensuing ten days, about seven quarts of matter. At the end of that time, the tube was removed and the opening immediately closed. The heart, which had been pushed around to the right side, resumed its natural position, and the lungs their proper functions. The cough ceased, swelling disappeared from his limbs, and his health gradually improved, until about September 1st, when he removed to Alexandria, Virginia, and went into business. Pension Examiner R. Loughran reports, October 16th, 1871: Adhesion of pleura and difficulty in expansion of chest and respiration. Almost constant pain in track of ball. Digestion greatly impaired, and general debility of the entire system. Partial anchylosis of elbow-joint. Tibia injured and soft parts consolidated; partial loss of motion of foot.*

Case 18.—Private Keefe, 14th United States Infantry, aged 21 years, while running the guard at Fort Trumbull, Connecticut, received three gunshot wounds, the missiles being buckshot. Two of the latter entered his legs, inflicting mere flesh wounds, while a third struck a rib, one inch beneath the angle of the left scapula, and coursed around the chest, and to the left, the length

* This case was reported, at great length, in the Proceedings of the Ellenville (Ulster County, New York) Historical Society, July 8th, 1864, and is copied in the *Medical and Surgical Reporter*, Philadelphia, 1865, Vol. XII, p. 137.

of a probe; its subsequent direction and position being doubtful. The shock to the system was marked and resulted in much depression. A slight cough commenced on the following morning, with bloody expectoration, both of which continued for three days and then ceased. This, in connection with a slight emphysematous condition of the cellular membrane, in the neighborhood of the external wound, indicated a probable injury of the lung. Auscultation and percussion failed for some time in announcing pathological changes, and, with the exception of a severe periodical cough, coming on every evening and lasting half an hour, there was nothing to cause suspicion of the approach of pleurisy, respiration being natural and the patient able to lie, from the first, on either side and in a horizontal position. Rest, rigid diet, and mild antiphlogistics, with morphia for the paroxysmal cough, were all the medication which he received at the outset. Though his countenance did not recover its accustomed hue and healthfulness, yet his appetite being good from the first, and there being no cough and but little, if any, dyspnœa, he was sent to quarters. Subsequently, physical examination detected a gradual effusion into the left cavity of the chest, which increased ultimately until the heart pulsated three inches to the right of the median line of the sternum. So gradual was its occurrence, that the opposite lung had been able perfectly to adapt itself to its increased and supplemental duties, and decubitis on either side, with the head low, was perfectly easy and without cough. The treatment consisted in large blister, frequently repeated, the use of squills, digitalis, and calomel, and, subsequently, hydragogue cathartics and iodide of potassium. Owing to unsusceptibility of the system to the action of mercury, its specific effects could not be produced by careful medication, and hence probably a ground of failure. Although there was no imperative symptom demanding an operation, yet, as the presence of effusion was so clearly indicated by stethoscope and other symptoms, it was thought advisable to operate, which was done substantially after the manner of Wyman and Bowditch, using a small exploring trocar, but in connection with the stomach-pump furnished army surgeons, in place of the more complicated instrument invented especially for this purpose. The resistance being considerable and the trocar delicate, it could not be forced in rapidly for fear of breaking, and the pleura was evidently pressed before the needle, and, although ultimately punctured, yet, from some cause, the orifice in the canula became closed after about six ounces of bloody serum had been discharged. The relief was, however, marked and permanent; respiration was deeper, vocal fremitus increased in extent, the heart in some measure receded to its accustomed position, and the patient became, in all respects, improved. Diuretics and hydragogue cathartics had an increased power, and within a fortnight after the operation there were some two or three pints of serous matter discharged apparently by fistulous opening into the bronchi. He constantly improved in health, and at his own suggestion was returned to garrison duty. In June, 1863, this man's chest was carefully examined, and the lower half of the left lung found dull on percussion, no vocal fremitus, and the heart pulsating a little to the right of the sternum. Not a pensioner. Acting Assistant Surgeon Isaac G. Porter, the operator, reported the case.* This man accompanied a detachment of his regiment to Madison Barracks, whence he deserted on September 18th, 1863.

In the four following cases, hydrothorax or empyema followed the lodgement of missiles in the chest, and tapping was employed as a palliative measure; the first three ended fatally, the last was a partial recovery:

Case 19.—Corporal J. Kelly, Co. B, 6th Wisconsin Volunteers, was wounded at the battle of Gettysburg, Pennsylvania, July 3d, 1863, by a musket ball, which entered the chest and lodged. He was treated at the hospital of the 1st division, First Corps. Paracentesis thoracis was performed by Surgeon A. W. Preston, 6th Wisconsin Volunteers, fifteen days after the reception of the injury. Death followed on the 21st day of July, 1863.

Case 20.—Private Philip Carpenter, Co. I, 4th Michigan Volunteers, aged 22 years, received a penetrating wound of the chest at Cold Harbor, Virginia, June 3d, 1864. A conoidal ball entered four inches below the outer third of the left clavicle, over the third rib. He was taken to the hospital of the 1st division, Fifth Corps. There he remained until the 12th, when he was transferred to Douglas Hospital, Washington. On admission, there was a large effusion into the left thoracic cavity, extreme debility, and dyspnœa. Assistant Surgeon William Thomson, U. S. A., performed paracentesis thoracis; seventy-two ounces of bloody serum were evacuated. The canula was allowed to remain, and during the night there was a free discharge. He spat dark blood at first, then pneumonic rusty sputa. Death resulted June 22d, 1864, from traumatic pleuro-pneumonia. At the necropsy, the lungs were found to be hepatized. There were fifty ounces of fluid in the thoracic cavity. Evidences of pericarditis were also found.

Case 21.—Private Thomas Kinney, Co. A, 17th United States Infantry, aged 36 years, was wounded at Petersburg, Virginia, September 30th, 1864, by a ball which entered under the inner third of the clavicle, one inch from the margin of the sternum, fractured the second rib, and lodged in the right lung. He was conveyed to the hospital of the Fifth Corps, and on October 7th was transferred to Harewood Hospital, Washington. When admitted, his constitutional condition was good. On October 11th, hæmathorax was diagnosed. The right lung was compressed, there was dullness on percussion, an absence of the respiratory murmur, and dyspnœa. Surgeon R. B. Bontecou, U. S. V., administered ether and performed paracentesis thoracis on the right side, between the sixth and seventh ribs, in the linea axillaris; five quarts of blood and serum were removed. The patient felt much relief after the operation, respiration becoming easy and audible through the whole of the right lung, except in the inferior part of the third lobe. The wound was covered with oil-silk to prevent the admission of air, and a Dover's powder was given every three hours. The case progressed as follows: October 12th, pulse 120. October 13th, feels pretty well; pulse 90; respiration audible as before. The wound discharged a bloody serous fluid. At 6 P. M., respiration was difficult, and percussion in the lower parts dull; respiration was not audible on the posterior side. The finger was introduced into the opening and a large amount of bloody serum discharged; the patient felt somewhat relieved. October 14th, weak; pulse 110; discharges free and of a putrid smell; crepitation. Percussion dull in lower part of left lung; respiration normal. Treatment, supporting; Dover's powder of ten grains every three hours. The patient continued to sink, and died October 20th,

* Porter, J. G.—*Cases*, in *Am. Jour. of the Med. Sciences*, N. S. Vol. XLVII, p. 135.

1864, from exhaustion. At the autopsy, ten hours afterward, both auricles, and the right ventricle of the heart, were found to be filled with fibrinous coagula. The pericardium contained a small quantity of serum. The right lung was collapsed and hepatized; the bronchi and their ramifications were filled with matter. The ball entered the inner margin of the middle lobe of the right lung and emerged on the exterior surface of the third lobe, slightly fractured the eighth rib, and was found lying on the diaphragm. The pleuræ were covered with lymph, and a spicula of the second rib was found. There were a few small tubercles at the apex of the left lung.

CASE 22.—Private D———, 40th Illinois Volunteers. Gunshot wound; ball entered right thorax; extensive emphysema followed. Paracentesis-thoracis performed. The patient recovered sufficiently to be discharged from hospital. The case is reported by Surgeon E. Andrews, 1st Illinois Light Artillery.

In two cases, in which paracentesis of the thorax was unavailingly performed, traumatic pleurisy, with effusion, followed gunshot wounds of the chest that apparently did not penetrate the pleural cavity:

CASE 23.—Sergeant *J. B. E*———, Co. D, 30th North Carolina Regiment, aged 19 years, was wounded at Kelley's Ford, Virginia, November 7th, 1863. The ball entered four inches to the right of the spinous processes, between the tenth and eleventh ribs, and emerged between the eighth and ninth ribs, in a line with the middle of the axilla. The eighth and ninth ribs were fractured near the wound of exit. The track of the ball was five inches long. He was taken prisoner and conveyed to Washington, entering Douglas Hospital on the 9th. The wound was considered a non-penetrating one, although the patient stated that he had coughed some florid, frothy blood, and had suffered from dyspnœa. His expectoration was slightly tinged with blood for several days after his admission. The wound discharged freely, and became very tender on pressure. A harassing cough and increasing dyspnœa indicated the presence of traumatic pleuritis. The treatment comprised diuretics, expectorants, with sedatives to procure sleep, tonics and nutrients, with stimulants, and iodine locally, in form of tincture, over the chest, as a counter-irritant. Acting Assistant Surgeon Carlos Carvallo, who reports the case, says: "At four and a half o'clock A. M. of December 8th, he awoke suddenly from a dream, very much frightened, coughed very hard, and expectorated freely an enormous quantity of remarkably thin, mucous, very frothy phlegm. At nine o'clock A. M., I found him exceedingly collapsed, though feeling himself, subjectively, very well—he thought he was strong. On examining his chest, I found a great deal of effusion in right chest, whizzing in the bronchial tubes, and some dyspnœa. After consultation, paracentesis thoracis was decided upon, and Assistant Surgeon William Thomson, U. S. A., introduced a trocar into the posterior lateral angle of the right chest, between the tenth and eleventh ribs, which was followed immediately by the exit of thirty-eight fluid ounces of pus. The operation was unaccompanied by pain and produced almost instantaneous relief from the dyspnœa. The whizzing also diminished to a great degree. Stimulants were freely administered. In the afternoon, the patient appeared to be in a moribund state, but toward night he rallied considerably and felt comparatively comfortable. He passed a restless night, though he breathed easier than before the operation. At seven and a half A. M., he said he felt strong and hopeful, but he died at quarter to ten o'clock A. M., December 9th, 1863." Necropsy: Several patches of ecchymosis in the intercostal muscles, between the ninth and tenth and eleventh and twelfth ribs. Right lung collapsed and shrunk up, and adherent to costal parietes of pleura. Left lung congested—otherwise normal. No signs of pneumonia. The pleural leaf which covered the internal surface of the right chest was exceedingly thickened and presented the appearance of leather. The pathological specimen, showing the anterior portion of the eighth rib on the right side fractured, with splintering of the internal surface, is No. 1901 of the Surgical Section, Army Medical Museum. A moderate osseous deposit has occurred. It was contributed by Assistant Surgeon W. Thomson, U. S. A.

CASE 24.—Corporal Israel Spotts, Co. G, 200th Pennsylvania Volunteers, aged 24 years, received a gunshot non-penetrating wound of the chest at Petersburg, Virginia, March 25th, 1865. He was conveyed to the hospital of the Ninth Corps, where hæmoptysis and dyspnœa supervened. On April 5th, he was transferred to Harewood Hospital, Washington. Surgeon R. B. Bontecou, U. S. V., reports that the ball entered the back in the dorsal region, about two inches below the spine of the scapula, and buried itself in the trapezius muscle, whence it was extracted. On admission, the condition of the injured parts and constitutional state of the patient were good. He did very well for a while, the wound healing kindly; but toward the early part of the month of May, the chest became enormously distended with effusion. There was a harassing cough, anxiety of countenance, oppressed breathing, and symptoms of empyema. An operation being necessary to relieve the patient, paracentesis thoracis was performed by Surgeon Bontecou, on May 9th, by freely opening the chest at the right posterior and lateral aspect, between the eighth and ninth ribs. About six pints of sanious pus were removed; no anæsthetic was used. The patient felt at once relieved and did remarkably well after the operation. The treatment consisted of simple dressings, anodynes, and supporting throughout. He was furloughed and sent to his home at Hammondstown, Pennsylvania. Dr. Stichley, attending physician, states: "Saw soldier after he reached home; found him suffering from empyema. After he was home a few days an operation was performed on him, removing two or three quarts of pus from his chest. Operation had to be performed every two or three weeks. The bullet was still in the lung. He lived in this condition for about two months. Death resulted September 20th, 1865, from exhaustion produced by suppuration."

On page 449, a complicated case of tapping for empyema is recorded; another case, attended by pneumothorax and empyema and treated by free incision into the thorax posteriorly is noted on page 493; an instance in which the diaphragm and liver were perforated in tapping is reported on page 504; and a case in which fluid, tinged with bile, was removed from the pleural cavity by paracentesis is referred to on page 513. Adding

these, to the twenty-four foregoing abstracts, a total of twenty-eight cases of thoracentesis is presented, with nine recoveries. Abstracting eight cases of effusion from idiopathic pleurisy, there remain twenty instances of tapping for effusions in the chest following injuries, with only four recoveries, a death rate of 80 per cent., indicating that the ordinary mortality of penetrating gunshot wounds of the chest is not materially affected by the operation. The side on which paracentesis was performed is indicated in twenty-five of the twenty-eight cases, and was on the right in fourteen, and on the left in eleven cases. Whether any significance should be attached to the fact that in twelve of the seventeen determined fatal cases the operation was performed on the right side, the figures are too few to decide.

Drainage Tubes.—In some of the cases of empyema, discharge from the pleural cavity was facilitated by the employment of drainage tubes, with the instruments and method so much insisted on by M. Chassaignac, or by using an ordinary gum catheter as a syphon. An ingenious plan of keeping apart the lips of sinuses, which it was desirable to have pervious, was in common use at Armory Square Hospital, and was devised, I believe, by that excellent surgeon, Dr. G. K. Smith, of Brooklyn. It consisted simply of a bent watch-spring, of the form indicated in the wood-cut (Fig. 275), with sufficient elasticity to separate the walls of long fistulous tracks in the soft parts. In suppuration in the thick muscles of the thigh or calf in compound fractures, this simple expedient was found far preferable to any form of tent or drainage tube, and it could be used advantageously in sinuses on the anterior aspect of the chest and abdomen. The utility, in cases of thoracic fistulæ of keeping the pleural cavity as far as possible, free from decomposing fluids, was universally acknowledged. The following is a case in which a tube was inserted daily. Frequently they were left in place permanently:

Fig. 275.—Watch-spring dilator for sinuses. *Spec.* 2153.

Case.—Private Gotlieb Messerly, Co. G, 80th Ohio Volunteers, aged 20 years, was wounded at Mission Ridge, Tennessee, November 25th, 1863, by a musket ball, which entered just below the left clavicle and passed out posteriorly, fracturing the inferior angle of the scapula. He was taken to the hospital of the 3d division, Fifteenth Corps, where he was treated until December 22d, when he was tranferred to the general hospital at Chattanooga. At the time of admission he was breathing rapidly and with great difficulty. On a physical examination of the chest, found the diaphragm forced down and bulging of the left intercostal spaces; the heart to the right side of the sternum and general dulness over the left side of the thorax. Change of position had no influence over the sounds elicited by percussion; no respiratory murmur could be discovered on the left side; that of the right was increased and sibilant. The pulse was frequent and weak. Appetite poor. Wounds of entrance and exit discharging small quantities of reddish pus. On the second day after his admission, a small tube was passed through the posterior wound into the pleural cavity and about twelve ounces of pus drawn off. After this the tube was inserted daily, and large quantities of thin fetid pus withdrawn. After the fluids were removed, the left side of the thorax became much contracted and the heart resumed its normal position. Tonics, stimulants, and anodynes were administered. The patient gradually sank, and died on January 11th, 1864, from exhaustion. Necropsy: Fifth, sixth, seventh, and eighth ribs fractured. Fragments of bone protruding in thoracic cavity. No attempt at repair. Base of heart opposite upper border of third rib; apex opposite intercostal space of fifth and sixth ribs, two inches from median line Pericardium thickened and containing one ounce of straw-colored serum. Left lung compressed against spinal column, and occupying a space five inches in length and one and a half in width. The remainder of the thoracic cavity was occupied by an abscess emptied of its pus but containing twelve ounces of bloody serum.

* See M. Hobon, *Du traitement de l'empyème purulent* par le *drainage chirurgicale*, 1867, Thèse de Paris, 141. This author has collected many favorable cases from the practice of M. Chassaignac, and Drs. Goodfellow, Banks, Fincham, and other English practitioners. See also M. Chassaignac, *Traité pratique de la Suppuration et du Drainage chirurgicale*, Paris, 1859, T. II, p. 346; also Drs Fuller, H. W., Powell, D., and Playfair, in *British Medical Journal*, 1872, February 17th, p. 183, and March 30th, p. 339, and Dr. Powell, in *Clinical Soc. Transactions*, Vol. III, p. 244; Dr. Maclagan (*Brit. Med. Jour.*, July 20th, 1872, p. 63. Mr. DeMorgan (*Med. Chir. Trans.*, 1859, Vol. XLII, p. 231) speaks favorably of the results of drainage in empyema at the Middlesex Hospital. Surgeon D. P. Smith, U. S. V., advocated the treatment at the beginning of the War (*Am. Med. Times*, July 6th, 1861. p. 13), but has not recorded any observations, that I can find, of later experience.

Incisions, Injections.—Surgeons Bontecou,[1] Hamilton,[2] Howard,[3] Ellis,[4] and others, advised or had recourse to free incisions into the pleural cavity in some cases of traumatic empyema, especially those complicated by the presence of foreign bodies or of coagula of blood. Personally, I am convinced that this is, under certain restrictions, sound practice; but I am unable to adduce any instances that testify, in a striking manner, to its efficacy. The cases that came under my observation were benefitted, I believe, by this interference; but they were not cured; and nearly all of those referred to by writers on this particular point were of such a character as to admit only of palliative measures.[5]

The utility of injecting stimulating fluids into the pleural cavity after purulent effusions had been evacuated and a permanent drain established, was advocated, but not acknowledged. The advantages of M. Boinet's method[6] were not realized. Surgeon F. H. Hamilton[7] advised, in cases complicated by the presence of foreign bodies in the cavity of the chest, thorough syringing, "with such disinfectants as carbolic acid, chloride of soda, or bromine;" but no evidence of their efficacy is produced. Tepid detergent injections, to wash away foul discharges, and occasionally bits of clothing or of exfoliated bone, and warm milk and water, as recommended by Guthrie (*Comm. l. c.*, p. 429), was found as unirritating and useful as anything. The advantage of the suggestion of this admirable teacher to have the opening, in these cases, as low as possible, was appreciated; though most surgeons did not venture on the eleventh intercostal space behind, as advised by him, the tenth intercostal space being considered as low a point as was consistent with the safety of the diaphragm.

The point of election for the first puncture, though in a measure determined by the seat of injury and the nature of the effusion, appears to have been the seventh intercostal space, one-third of the distance from the spinous processes of the vertebra to the median line of the sternum. This point was selected in nine of seventeen cases in which this particular is noted. In five, the puncture was made between the eighth and ninth ribs, and once in the fourth, once in the fifth, and once in the tenth intercostal space. The ordinary trocar, furnished in the field operating cases, was usually employed; but, in a few instances, the methods and apparatus recommended by Drs. Wyman and Bowditch,[8] and by Dr. Flint were employed.[9]

1 Dr. Bontecou, *ante*, p. 493; 2 Hamilton, *Prin. and Pract. of Surg*, p. 702; 3 Howard (*l. c.*), 4 Ellis (*N. Y. Med. Jour.*, Vol. XIV., p. 511).

5 Hippocrates, according to Haller, sanctions paracentesis of the chest in empyema, by boring through a rib, in the treatise περι των εντος παθων. Leonides taught that the thorax might be opened between the fifth and sixth ribs, to remove pus, though he, or Paul of Ægina, adds that this will not avoid the fatal result. Lusitanus (*Curat. Medic. Cent.*, Florence, 1551; Cent. II, and Cent. III) cites two fatal and one successful example of this operation in empyema. Smetius (*Mis. Med. Lib*, XII. Francof. 1611) gives an instance of successful paracentesis for the evacuation of putrid pus *in a case of wound of the chest.* Chiflet (*Singulares tam ex curat. quam ex cadav. sect. Obs.*, Paris, 1611) advises thoracentesis in empyema. Heers (*Obs. Medicæ*, Leodii, 1622) taught that the thorax should be perforated between the fifth and sixth ribs, not between the fourth and fifth, for fear of wounding the diaphragm. Bartholinus (in libello *de pulmonibus*, Hafniæ, 1636) dwelt upon the danger of admitting air into the pleural cavity, and suggested expedients for avoiding it in paracentesis. M. G. Purmann, a military surgeon of Breslau, whom Percy accredits as the first to practice thoracentesis, advocates the operation in his *Chirurgischer Lorberkranz, oder grosse Wundartzney* (Halberstadt, 1685, Frankfort, 1692, Breslau and Leipsig, 1705), and, in the last edition, cites a successful case of thoracentesis, for traumatic effusion of blood and pus. After him, Albinus, Verduc, Brunner, Petit, and Valisnieri, refer to paracentesis in empyema, with approbation. On the applications of the operation in military surgery, something may be found in Ravaton (*Traité des Playes des Armes a Feu*, Parjs, 1750); Garengeot (*Traité des Op.*, Paris, 1748); Heister (*Instit. Chir.*, Amsterdam, 1739), and in Percy (*loc. cit.*); in Larrey (*Mém. de chir. mil.*, Paris, 1812, T. III, p. 442; in Hennen (*Mil Surg.*, 3d ed., 1829, p. 382); and in Guthrie (*Comm.* p. 424).

6 M. Boinet, *Traitement des épanchements pleurétiques purulents par les Injections en général et les Injections iodées en particulier*, in Arch. gén. de Méd., 1853, 5e S., T. I, pp. 277, 521. 7 Hamilton, F. H., *The Principles and Practice of Surgery*, 1872, p. 112.

8 Bowditch, H. I., *On Pleuritic Effusions and the Necessity of Paracentesis for their Removal*, Am. Jour. of the Med. Sci., Vol. XXIII, p. 320.

9 Rust (*Theoretisch-praktisches Handbuch der Chirurgie*, Berlin, 1834, p. 57) advises to incise midway between the sternum and spine, at the upper margin of the last rib, to avoid the main branch of the intercostal artery, but, unless the operator is well satisfied that the diaphragm is much depressed, it is undoubtedly imprudent to puncture below the sixth intercostal space anteriorly or at the side, and below the tenth posteriorly. Dr. Rust gives the following list for the points of puncture selected by different operators: ninth intercostal left and eighth on right side, Hippocrates, Vesalius, Tulpius, Plattner, Ollenroth, Le Blanc, Pelletan, Sabatier, Richerand, Larrey; fifth, Paulus Ægineta, Fabricius Aquapendente, Dionis, Barbette; eighth intercostal, the width of four fingers below the scapula, five or six inches from the spine, Garengeot, Le Dran, Nuck, v. Walther; sixth intercostal, Scultetus, Sharp, Bromfield, Gooch, B. Bell; fourth, Paré, Severin, Camper, v. Ammon; tenth, Lusitanus, Heister, Desault, Chopart; Langenbeck advises the width of four fingers from the processes of the spine and the same distance below the scapula.

Balls and Foreign Bodies Lodged.—It has already been shown by many examples that the lodgment of projectiles or other foreign bodies within the chest does not necessarily involve a fatal result. After provoking serious inflammatory accidents or hæmorrhages, the presence of such extraneous substances comes to be tolerated, and they remain in the substance of the lung, invested, according to Ballingall and others, in an adventitious cyst or capsule, or lie loosely in the pleural cavity, or roll about upon the diaphragm, or are imbedded harmlessly in the muscular tissue of the thoracic parieties. More commonly, they give rise to purulent formations and hectic fever; but even under these circumstances life is occasionally preserved by extraction of the foreign body, or by its spontaneous expulsion, either through the bronchial tubes or through fistulæ in the walls of the chest. Some of the more remarkable illustrations reported during the war may be here grouped together:

Case 1.—Private James Apple, Co. I, 42d Ohio Volunteers, was wounded at Vicksburg, Mississippi, May 20th, 1863, the ball struck the top button of his blouse, which it carried with it; entered the right lung two inches below the clavicle, close to the sternum, ranged obliquely downward, and lodged behind and a little below the axilla. Surgeon J. C. Kolb, 42d Ohio Volunteers, examined the wound and removed the ball and button; the button was found to have been split into four pieces; a piece of blouse about two inches square adhered to one of the fragments. The patient was taken to the hospital of the Thirteenth Corps, where he remained until June 4th, when he was transferred, per hospital steamer R. C. Wood, to Memphis, entering the Union Hospital on the 8th. On July 15th, 1863, he was transferred to Convalescent Camp; he was finally discharged from service on December 2d, 1864. Pension Examiner R. Wirth, reports that there is consolidation of the upper lobe of the right lung, causing difficulty of breathing; shoulder joint partially anchylosed. Pension Examiner Albert Wilson reports, September 20th, 1867, that the pensioner has recovered all the functions of the parts involved. Disability none. Under date of May 15th, 1871, Pension Examiner J. H. Maxwell reports that there is considerable dulness on percussion, and some difficulty of breathing. Disability two-thirds and indefinite. The wood-cut (Fig. 276) shows the missile, a conoidal ball, and two of the fragments of the brass button, which were contributed by Mr. W. D. McJilton.

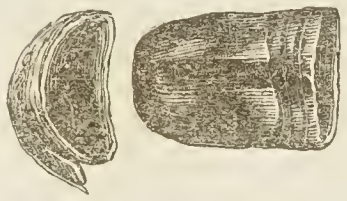

Fig. 276.—Ball and piece of button extracted from the right lung. *Spec.* 5968, Sect. I, A. M. M.

Case 2.—Private Christopher Holmes, Co. H, 7th Connecticut Volunteers, aged 25 years, was wounded at Fort Fisher, North Carolina, January 15th, 1865, by a conoidal ball, which entered one and a half inches below the middle of the right clavicle, passed through the superior border of the right lung, and emerged at posterior axillary border. He was carried to the field hospital where simple dressings were applied to the wound. On January 20th, he was put on board the Hospital Steamer Spaulding and conveyed to New York, entering McDougall Hospital on the 25th. He was discharged from service on May 4th, 1865. Pension Examiner R. M. C. Lord reports, on September 22d, 1866, that Holmes is a pensioner, his disability being rated three-fourths and probably permanent. In a letter to this Office, dated New London, Connecticut, January 10th, 1872, Dr. A. W. Nelson reports: "'Blood came out of his mouth.' The ball carried in his coat button. The eye and inner part were removed—the outer thin shell was too deep for safe extraction. He made a good recovery; now has fair health and good weight. The right lung is a little sensitive to dust, etc. Has never had a sinus or any troublesome symptom from his wound or the button. Last September it had approached the surface. For six weeks it has given him some pain, and yesterday I removed it by an incision through the skin and areolar tissue one and a half inches above the nipple. Holmes carried this fragment for seven years without suppuration. From its appearance and the tenderness of the surface, I doubt not, in a few weeks or months, the piece had come out without surgical aid. This little body seemed to be encysted." It was contributed to the Army Medical Museum by the operator, and is represented in the adjacent wood-cut (Fig. 277).

Fig. 277.—Button removed from chest after seven years. *Spec.* 5956, Sect. I, A. M. M.

Case 3.—First Lieutenant William P. Wright, 1st New York Independent Battery, aged 28 years, was wounded at Gettysburg, Pennsylvania, July 3d, 1863, by a conoidal ball, which entered the thorax two and a half inches from the nipple of right side, on a line between it and the acromion process, and emerged five inches from the spine, two inches from the inferior angle of the scapula, in a line with the apex of the shoulder. He was received into the Sixth Army Corps hospital soon after he was wounded. There was considerable hæmorrhage, resulting in an unusual amount of prostration, especially after the removal of pieces of clothing, of which there were several; he was placed in a recumbent position, opium and cold drinks administered, and the wounds dressed. On August 5th, he was admitted to Camp Letterman Hospital, Gettysburg, where he remained under treatment until end of August, when, having sufficiently recovered, he was allowed to go to his home. At this time he was able to walk some distance without difficulty. Several pieces of bone were discharged from the posterior opening during the next six weeks, when it healed; the anterior wound continued to discharge two or three weeks longer, bringing away small pieces of clothing and some horse hairs from the stiffening of his coat. He was able to walk at this time with little fatigue; but for several months could not sleep in a horizontal position. He was finally discharged the service June 6th, 1864. March 14th, 1866, he was perfectly well, and could bear gymnastic exercise. The right chest is one-half inch less in circumference than the left. The case is reported by Surgeon L. W. Oakley, 2d New Jersey Volunteers. Not a pensioner.

It is not uncommon for a ball, after penetrating the thorax and passing through the lung, to be reflected from the pleural surface of the opposite costal wall, and to fall upon the diaphragm, and find its way into the posterior costo-diaphragmatic angle, as in the following case of hæmothorax:

CASE 4.—Private Erastus Roberts, Co. H, 12th Illinois Cavalry, aged 18 years, was wounded at Rappahannock Station, Virginia, October 12th, 1863, by a conoidal ball, which entered near fourth rib, between right scapula and spinal column, and penetrated the chest. He was admitted to Emory Hospital, Washingtou, on the next day. There was severe pain in the right lung and great dyspnœa; absence of respiratory murmur in right side. The treatment consisted of dressings, bandage around thorax, and opiates. He died October 15th, 1863. Autopsy showed rib fractured at place of wound; cavity of right chest full of blood; right lung collapsed but not wounded; the ball was found in the right thoracic cavity. *Spec.* No. 4496, Sect. I, A. M. M., is an elongated conoidal ball, notched at the apex and longitudinally grooved on one side of the body, and was contributed, with a history of the case, by Acting Assistant Surgeon A. M. Plant.

It is very common for the ball to posses sufficient momentum to carry it through the thorax and yet be detained by the elasticity of the skin, beneath the soft parts on the side of exit. In such cases the ball is usually cut out on the field; but is sometimes suffered to remain until the patient's arrival at a permanent hospital, as in the following cases:

CASE 5.—Private *Carlos E. Lawrence,* Co. E, 57th North Carolina Regiment, aged 34 years, was wounded at Rappahannock Station, November 7th, 1863, by a conoidal ball, which entered one inch to the right of the spinous process of the sixth dorsal vertebra, passed forward and lodged one inch inside of the right nipple. On the 9th, he was admitted to Armory Square Hospital. The patient, whose constitution was not naturally strong, was extremely debilitated and much enfeebled from the effects of the wound, which was much swollen and highly inflamed. On the 10th, the ball was excised by Acting Assistant Surgeon D. W. C. Van Slyck. The patient's system failed to respond to the most thorough and stimulating treatment, and he continued to sink, and died on November 16th, 1863, from asthenia. The missile, somewhat roughened near the apex, was forwarded to the Army Medical Museum, with a minute of the case, by Surgeon D W. Bliss, U. S. V., and is represented in the wood-cut adjoining (FIG. 278).

FIG. 278.—Ball removed after traversing the chest. *Spc.* 563, Sect. I, A. M. M.

The next abstract illustrates not only this feature, but the rapid development of hydrothorax which sometimes follows penetration of the lung by a musket ball:

CASE 6.—Sergeant Thomas Clark, Co. I, 1st United States Cavalry, was struck by a carbine ball in the cavalry fight near Brandy Station, Virginia, August 1st, 1863. On the next day he was admitted to Douglas Hospital, Washington. When admitted, the bullet was discovered beneath the integument, below the inferior angle of the left scapula, whence it was removed by Acting Assistant Surgeon J. E. Smith. The wound of entrance was found anteriorly over the third rib, which had been fractured. This case was diagnosed as a penetrating wound of the left thoracic cavity, involving the upper lobe of the lung. There had been hæmoptysis and dyspnœa, and there was when admitted great prostration. The clinical history of the case is very imperfect. On the 7th, the patient was found almost *in articulo mortis,* and fully comprehended the situation; but after a consultation it was concluded that no operation at that period would be of avail. The effusion had almost filled the left side, and was causing dyspnœa and profound depression, and at 11 A. M. death took place. Previous to the autopsy, a trocar was introduced below the angle of the scapula, between the eleventh and twelfth ribs, and evacuated half a gallon of bloody serum. On examining the lungs, the track of the bullet was found lined with spiculæ of bone from the comminuted rib. There was local pneumonia of the upper lobe, with the usual evidence of pleuritis; copious effusion of serum, and extensive exudations of lymph. No other lesions were discovered, and death occurred from the traumatic pleuritis and its consequent effusion. The accompanying wood-cut (FIG. 279) gives some idea of the course of the ball. It was drawn from a wet preparation forwarded to the Museum by Assistant Surgeon W. Thomson, U. S. A., then in charge of Douglas Hospital.

FIG. 279.—Preparation of portion of the upper lobe of the left lung, showing the track of a conoidal musket ball, which is attached. *Spec.* 1678, Sect. I, A. M. M.

In the next case the apparent direction of the ball would suggest that both pleural cavities were opened; but it is probable that its track on the right side lay without the thorax:

CASE 7.—Private Chauncey Pinney, Co. D, 154th New York Volunteers, aged 25 years, was wounded at Gettysburg, Pennsylvania, July 1st, 1863, by a conoidal ball, which entered the left side, fractured the seventh rib about its middle, traversed the cavity of the chest, and lodged in the right side, three inches external to the angle of the sixth rib. He was treated in the

field hospital until August 6th, when he was transferred to the hospital at Camp Letterman. The patient had suffered little from the effects of the injury. The ball was excised and the wound was dressed with simple cerate and tightly supported by adhesive plaster. Tonics were administered, with an opiate occasionally, and at night. From the wound of entrance there was a protrusion of about an inch in size, which was at first believed to be a hernia of the lung, but subsequently proved to be tissue which yielded to caustic. Suffered from dyspnœa and slight cough; right leg very sore and lame from rheumatism. August 13th, general health improving. September 1st, wound presented a healthy granulating surface, with slight suppuration. He continued to improve, and, on October 1st, was transferred to Broad Street Hospital, Philadelphia; on January 22d, 1864, to Mower Hospital, whence he was returned to duty February 10th, 1864. On November 1st, 1864, he entered Hospital No. 8, Nashville, and was again returned to duty January 1st, 1865. On April 29th, 1865, he was admitted to the hospital at Elmira, New York, and was finally discharged from service July 7th, 1865. Acting Assistant Surgeon A. B. Stonelake reports the case. Pension Examiner Ira Shedd reports, under date of May 2, 1867: "A conoidal ball entered the left side of the chest, between the tenth and eleventh ribs, and emerged on the opposite side about two inches anterior to the spinal column, fracturing in its passage one of the vertebræ, and injuring the left lobe of the lung and spinal cord or nerves. Has neuralgia of right leg; is permanently lame, often having severe pain; pain in back and loins, with dysury and partial retention of urine, the result of spinal irritation; strabismus, and loss of sight merging to amaurosis, evidently increasing in severity, resulting from the original spinal injury; fatigue, and often producing dyspnœa and great prostration. Disability total and permanent in present degree." He was still a pensioner in March, 1872.

The exact site of lodgement is almost always obscure, and sometimes is not in the cavity in which the indiscreet tyro would persist in groping for it with his probes, as in the case of Corporal William N——, related at page 451, in which the missile (FIG. 204) penetrating the chest above the right clavicle, passed downward, and, impinging on one of the dorsal vertebræ was deflected, and traversed the mediastinum and lower lobe of the *left* lung, and diaphragm, and lodged under the greater curvature of the stomach. The case of Captain Stolpe, related on page 515, and illustrated by PLATES XI and XII, and also the following case are in point. In the latter instances, the balls were voided at stool:

CASE 8.—Private Thomas B. Belt, Co. C, 155th Pennsylvania Volunteers, having been wounded at Petersburg on March 25th, was admitted to Armory Square Hospital, Washington, on April 24th, 1865. A bullet had entered through the cartilaginous portion of the seventh rib, passed into the region of the transverse colon, and lodged. On admission, the patient suffered from traumatic fever, severe pain in the region of the wound, extending over the abdomen, hiccough and vomiting—the vomited matter consisting of small particles of greenish matter. There was difficult respiration and anorexia; the surface was covered with a cold, clammy perspiration, and there was great difficulty in making water. The treatment in this case consisted of a demulcent and anodyne decoction, of which a wine-glassful was taken four or five times daily; the free use of cracked ice, and a very limited diet of beef-tea, not exceeding six ounces daily. On April 29th, the patient being seized with severe pain in the bowels, passed the ball while defecating. Immediate relief followed, and on May 1st, 1865, the patient was doing well. He was discharged the service on September 22d, 1865. The missile was contributed to the Army Medical Museum, with the foregoing account, by Acting Assistant Surgeon C. H. Bowen. It is shown in the adjoining wood-cut (FIG. 280). Belt is not a pensioner.

FIG. 280.—Conoidal ball, much disfigured and containing several bony spicula imbedded. *Spec.* 1569, Sect. I. A. M. M.

CASE 9.—Private William Welsh, Co. F, 51st Ohio Volunteers, received a gunshot wound of the thorax, at Murfreesboro', Tennessee, December 31st, 1862. He was taken to the hospital of the 3d division, Fourteenth Corps, and simple dressings applied to the wound. On January 10th, he was transferred to Hospital No. 19, Nashville, whence he was conveyed, on January 30th, per hospital boat Emerald, to Covington, Kentucky, entering Seminary Hospital. He died on February 14th, 1863. At the necropsy, a buckshot was found to have entered the right breast, between the fifth and sixth ribs, fracturing the sixth, passed through the parietes into the cavity in a direction downward and toward the spine, wounding the pleura, passed through the diaphragm, and diagonally through the right lobe of the liver, close upon the superior extremity of the right kidney, but doing no material damage to that organ, and lodged in the body of the first lumbar vertebra, about three lines from the spinal canal. In the cavity of the chest on the right side, between the pleura-costalis and pleura-pulmonalis, adhesions were strong throughout, and when separated there were appearances of pus on the surface of the lung. The lung itself exhibited signs of inflammation in its whole extent, and was collapsed to about half the size of the left lung. No evidence appeared that this lung had been wounded, although it is possible that it did not wholly escape injury. Heart and left lung normal. There was not much fluid in the pleural cavity, but the fold of the pleura passing over the diaphragm had a large coagulum intervening between it and the diaphragm. Abdominal viscera all healthy, except the liver, which was much congested, with signs of inflammation along the track of the ball. The case is reported by Surgeon J. T. Carpenter, U. S. V.

In the next case, fragments of clothing were expectorated four months after the reception of the wound:

CASE 10.—Lieutenant-Colonel John B. Collis, 7th Wisconsin Volunteers, aged 35 years, was wounded at Gettysburg, July 1st, 1863, by a ball, which entered the right side, immediately over the tenth rib, midway between the sternum and spinal

column, fractured the rib, passed downward and backward, and lodged. He was admitted to the hospital of the 1st division, First Corps. It appears that he was subsequently admitted to a private house at Gettysburg, on August 2d. He had, for some time, fever, with jaundice; never had bloody expectoration, though sometimes considerable cough. There was no discharge of bile from the wound. On August 12th, the patient was gradually improving; the wound had healed; tenderness nearly absent; liver still hard and slightly enlarged; base of right lung dull on percussion; appetite good, and general health much improved. The treatment consisted of counter irritation over the liver and lungs; the administration of tonics and anodynes, with stimulants, and a full diet. The patient was transferred on September 2d, 1863. He was admitted to hospital at Annapolis on November 8th, 1863. Writing from that city, under date of November 19th, 1863, the patient furnishes the following additional particulars: After having been wounded, he suffered intense pain in the region of the liver, the right lung and shoulder, and expectorated blood. His right leg and arm were partially paralyzed, and in sixteen or twenty hours he was much jaundiced. On September 1st, he started for his home in Wisconsin, still unable to help himself. Arriving at Altoona, Pennsylvania, an abscess that had formed in the liver, broke into the lung, and its contents were expectorated, the wound being closed externally. A surgeon informed him that the matter he was then raising consisted of pure bile. This discharge continued until he arrived at Chicago, when the passage seemed to close up. At Boscobel, Wisconsin, where he lay over ten days, the discharge reappeared, and he raised about a quart of yellow or greenish matter, tinged with blood, and very bitter. On October 5th, he walked alone for the first time, after which, improvement took place. He occasionally raised pus from the lungs, and, on November 16th, in a paroxysm of coughing, two pieces of woolen cloth were ejected. (See wood-cut, FIG. 281.) At date of writing, he suffers extremely from soreness in the region of the liver and right lung, and right shoulder; thinks the ball lies at the back of the lower lobe of the right lung, where he experiences a heavy, tearing pain. The injured lung is hepatized and very tender; the right arm and leg still have a numb sensation. Acting Assistant Surgeon J. H. Longnecker writes from Annapolis, under date of November 20th, "the patient is doing well, with every prospect of being able to return to duty shortly," and again on the 26th of the same month "there has been no ejection of bile since he is here." The patient was discharged the service on December 28th, 1863, for physical disability, and was pensioned, his disability being rated total and permanent. On June 20th, 1864, he was appointed Major in the Veteran Reserve Corps, when his pension was dropped. He was promoted to Lieutenant Colonel on February 11th, 1865; was discharged on May 4th, 1868, and again pensioned. A communication from Pension Examiner C. F. Fulley, dated August 30th, 1870, reports the patient subject to hæmorrhage from the lungs, and to partial paralysis of the lower extremities. The lower portion of the right lung is consolidated and adherent to the pleura; the patient is weak and emaciated. His disability is rated total. In March, 1872, he was still a pensioner.

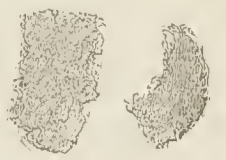

FIG. 281.—Two pieces of woolen cloth ejected from the lungs. *Spec.* 3990, Sect. I, A. M. M.

In two of the three following cases, it is alleged that balls were extracted from the substance of the lung; and in the third, from a lodgement within the pleural cavity upon the apex of the left lung. The latter case should be compared with that of Cottrell, on page 424. It is to be regretted that so few details are given of the removals of the missiles from the pulmonary parenchyma:

CASE 11.—Private W. S. Jenne, Co. B, 6th Vermont Volunteers, aged 20 years, was wounded at Fredericksburg, May 4th, 1863, by a spent minié ball, which struck him, while lying down, just behind the right clavicle, a little to the outside of the middle, passed directly downward into the apex of the lung, and lodged at a depth of one and a half inches. It was extracted from the entrance wound about a week afterward. He was left on the field in the enemy's hands until May 12th, when he was paroled and taken to Potomac Creek Hospital, where he remained until it was broken up, about the middle of June, when he was transferred to Annapolis, Maryland. On December 29th, he voluntarily returned to his regiment; the wound had nearly healed, but still discharged slightly. He continued on duty with his regiment until its muster out in the summer of 1865. October 5th, 1865: The wound occasionally breaks out and discharges for a short time. His breathing is somewhat shorter after exertion than formerly, but his health is otherwise good. Pension Examiner E. P. Watkins reports that the clavicle is injured to such an extent as to disable him somewhat. He was pensioned, his disability being rated total, and doubtful as to permanency. Was last paid March 4th, 1872.

CASE 12.—Sergeant Andrew McRae, 5th Maine Battery, aged 30 years, received a gunshot penetrating wound of the chest at Chancellorsville, Virginia, May 3d, 1863. The missile entered two inches below the right clavicle and penetrated the right lung. He was treated in the field until the 9th, when he entered Carver Hospital, Washington, whence he was discharged from service February 18th, 1864. Pension Examiner T. B. Smith reports, under date of February 19th, 1864: "The ball entered the right side of the chest, between the second and third ribs, one inch from the sternum, perforated the lung, and was extracted through the wound of entrance. The lung is still unsound, health bad, cough, &c. Disability total for two years." Pension Examiner W. D. Stewart reported, September 26th, 1867, that the scar was small and looked healthy. General health good; disability none. On February 26th, 1872, Pension Examiner J. O. Stanton, reëxamined McRae and stated that there was "some dulness on percussion over upper portion of right lung, with diminished respiration; he has a hard dry cough. The action of the heart is much increased. There are evidently pleuritic adhesions in the region of the wound, and he has, in my opinion, chronic bronchitis; all caused, no doubt, by the wound. Disability three-fourths and uncertain."

CASE 13.—Private Seth Cooper, Co. M, 2d Massachusetts Cavalry, aged 23 years, was wounded at Vienna, Virginia, December 21st, 1863, by a conoidal ball, which entered at a point one-half inch in front of and above the left ear. He was taken to the field hospital, where the wound was examined and search made for the ball. A probe could be passed through the point of entrance to the condyle of the occipital bone, which obstructed and changed the course of the ball, it being impossible to trace it further. Perfect quiet and rest were enjoined, with the expectation that the ball would become encysted. Three weeks later

inflammation set in and rigors commeneed, and the patient's life demanded that the ball should be found and removed. A probe was again introduced to the condyle of the occipital bone, a free incision made down to the end of the probe, the finger passed downward to and under the clavicle, when the ball was found resting upon the apex of the lung and was removed. The wound healed by granulations, and recovery ensued, with paralysis of the facial muscles of the injured side. On June 11th, 1864, he was transferred to Campbell Hospital, Washington; on July 2d, to Cony Hospital, Augusta, Maine, and, on July 14th, to the hospital at Readville, Massachusetts, whence he was returned to duty November 9th, 1864. He was discharged from serviee April 4th, 1865. Pension Examiner George W. Farrar, under date of July 26th, 1867, says, that the right side of the face is paralyzed and that the pensioner suffers from severe attacks of neuralgia. His health is seriously impaired. Disability one-half and permanent. His name was still borne on the Pension List on June 4th, 1872.

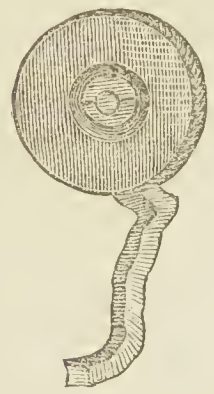

FIG. 282.—The metallic portion of a tompion removed from the lower lobe of the right lung. *Spec.* 616, *b*, Sec. 1, A.M.M.

The soldier's culpable negligence in failing to remove the tompion before firing, resulted sometimes in the bursting of the piece; sometimes in the projection of the tompion with sufficient force to penetrate, within short range, a man's body; almost always, unfortunately, in more injury to others than to himself. The following is one of these cases, in which the stopper was lodged in the lung, and the damage done to the ribs and internal viscera are illustrated by specimens in the Museum:[1]

CASE 14.—Private G. M———, Co. C, 13th New Jersey Volunteers, was shot at Bolivar Heights, Maryland, September 17th, 1862, by a soldier, in the rear rank, who neglected to remove his tompion. The missile penetrated the chest from the back and fractured the eleventh rib. The wounded man was carried to the hospital of the 1st division of the Eighth Corps. His breathing was oppressed almost to suffocation; his pulse weak and fluttering; the blood oozed from the posterior wound in a florid track, but not profusely; there was frothy hæmoptysis with frequent painful efforts at coughing. A broad chest bandage, decubitus on the right side, and an opiate, made his condition more tolerable toward night, and, on the following day, he was placed in a hospital railway car and sent to Baltimore a distance of eighty miles, and thence, a hundred miles farther, by rail, to Philadelphia. On the 26th, he was admitted to South Street Hospital, Philadelphia, in a state of great prostration, with the symptoms of traumatic pleuro-pneumonia and hepatitis. There was extreme irritability of stomach, frequent cough and dyspnœa. The lower right chest was flat on percussion; there was a sanious purulent discharge from the wound. The patient died on October 15th, 1862. At the autopsy, the evidenees of extensive inflammation of the right pleural cavity and of peritoneal inflammation in the vicinity of the liver, were very apparent. *Spec.* No. 616, Sect. I, A. M. M., shows the lower lobe of the right lung and part of the liver, with a portion of the diaphragm intervening, to which both viscera are firmly adherent. The lung was wounded by the metallie portion of the tompion, which was imbedded in it. The preparation is imperfectly represented in the accompanying wood-cut (FIG. 284), reduced to one-fourth size, from a drawing of the dissection made at the Museum. In the inferior portion the button of the tompion, represented of natural size in FIG. 282, is seen impacted in the lung tissue, which is in a state of grey hepatization. The cut orifices of large bronchial tubes and arterial and venous trunks appear in the left upper portion; and, to the right, an attempt is made to delineate the thickened pleura and diaphragm, to which the lung adhered firmly, and the convex surface of the liver, which partly adhered to the diaphragm. *Spec.* No. 617, of the same section, represented in FIG. 283, shows portions of the last three ribs of the right side, with the eleventh completely fractured. The fragments are partially united by new bone, which entangles some necrosed portions. Both preparations were contributed, with a history of the case after the patient's admission to South Street Hospital, by Acting Assistant Surgeon H. Hart. The other notes are taken from the field reports.

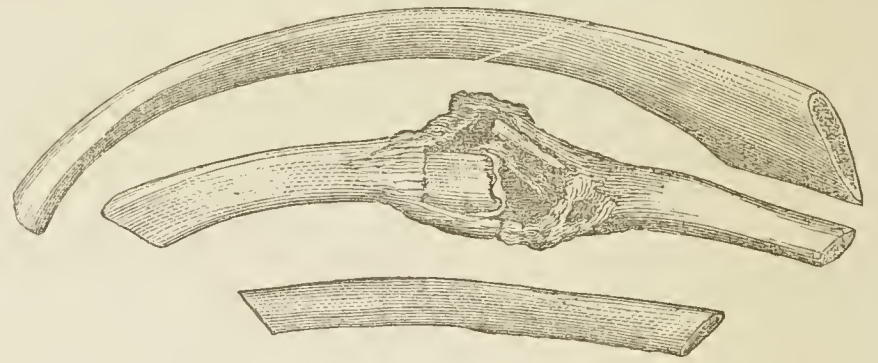

FIG. 283.—Posterior view of sections of the right tenth, eleventh and twelfth ribs, the eleventh comminuted by a tompion. *Spec.* 617, Sect. I, A. M. M.

FIG. 284.—Section of the lower lobe of the right lung, with the button and wire of a tompion imbedded in it, a portion of the diaphragm and of the liver appear at the upper right hand of the preparation. *Spec.* 616, Sect. I, A. M. M.

The following is one of the best illustrations that the Museum possesses of the method that Nature sometimes pursues in order to render a foreign body unirritating, by encysting it. A conoidal ball had lodged in the lower lobe of the left lung. Its passage through

[1] Dr. Robinson (*Diary of the Crimean War*, page 376) gives a curious instance of wound by a tompion. See also *Spec.* 246, Sect. I, A. M. M.

an intercostal space and through the lung substance had been attended by the least possible amount of laceration and bleeding; yet it had struck and fractured the sternum, and, when reflected, had injured the pericardium sufficiently to light up inflammation. Most of the track healed kindly; the constitutional symptoms were slight at first, and were due to the pericardial rather than the pulmonary lesion. The ball rested a quarter of an inch beneath the pleura. The track leading to it was cicatrized. A well-marked zone, with a radius of about one inch, surrounded the ball. On the immediate confines of this zone, the lung tissue was normal in appearance, and, under the microscope, the only alteration noticeable was slight enlargement of the capillary net-work about the air-cells. Within the line, clearly defined in the specimen hardened in alcohol, the tissues had undergone cheesy metamorphosis, the progressive stages being met in approaching the ball, in the immediate vicinity of which were chalky deposits:

CASE 15.—Corporal W. S———, Co. H, 151st New York Volunteers, aged 26 years, was admitted to the 3d division hospital, Alexandria, December 4th, 1863, with a gunshot penetrating wound of the left chest, received at Locust Grove Virginia, November 27th. A conical ball entered two inches below the coracoid process, passed inward and downward and lodged in the posterior portion of the lower lobe of the left lung. When admitted, there was slight constitutional disturbance, diminished respiration of apex of left lung, slight cough, and white frothy expectorations. Sedatives, anodynes, and stimulants were administered, with nourishing diet. On the next day, the patient was able to walk about the ward and seemed quite comfortable. Nothing occurred to attract particular attention until January 3d, when the expectoration was noticed to be very offensive; respiration scarcely perceptible in the left lung; pulse very weak. January 8th, 1864, breathing labored, complete dulness of left side extending to right of sternum. He gradually sank, and died on January 10th, 1864. Necropsy: Left pleural cavity filled with serum; lung compressed in small space. Pericardium was much distended with fluid, amounting to twelve ounces, and the second rib comminuted. The ball had struck the sternum at the articulation of the second rib, which was denuded and rough. The whole surface of the pericardium was covered with coagulated lymph having the appearance of tripe. The ball was found in the posterior portion of the lower lobe of the right lung; the liver was enlarged and soft. A preparation of a portion of the left lung, with the missile lodged just beneath its surface, is represented in the wood-cut (FIG. 285). The lung has been laid open to display the lodgement of the ball. Even the rings on the base of the projectile are imprinted on the cheesy tissue. The specimen was contributed, with a history of the case, by Acting Assistant Surgeon W. G. Elliott.

FIG. 285.—Conoidal ball encysted near the free edge of the lower lobe of the left lung. The segment of the lobe is laid open to show the lodgement of the missile. *Spec.* 2014, Sect. I, A.M.M.

Some other remarkable examples of observations made *post-mortem* of the lodgement of foreign bodies will be inserted here:

CASE 16.—Private John M. Mosher, Co. I, 1st Maine Cavalry, was wounded at Brandy Station, Virginia, October 12th, 1863, by an elongated rifle ball, which struck near the costal cartilage of the fifth rib, coursed inward and to the right, and, passing over the xiphoid appendage, perforated the diaphragm, entered the liver immediately to the right of the suspensory ligament, passed outward and slightly upward and emerged on the posterior surface of the greater lobe to rest beneath the diaphragm. He was taken to the field hospital, where he remained for several days, when he was sent to Washington and admitted to Lincoln Hospital on the 19th. Death resulted on October 20th, 1863, from pericarditis and pleurisy. The necropsy revealed the course of the ball. The right lung was not visible, its site being occupied by a puffy mass of emphysematous cellular tissue in a state of inflammation; toward the median line this infiltration was covered by a thick layer of exudation of a dark purplish red color. The pericardium was covered externally with a layer of lymph of a recent formation. There was about one-half pint of dark and serous fluid in each pleural cavity. On section of the first and second lobes they were found congested, especially at the apex of the first. Bronchial irritation was shown by the excess of the frothy secretion in this part. Immediately to the right of the suspensory ligament a ragged roundish opening was seen; five and a half inches to the right, and, on a line with this, another opening was observed of the same general appearance as the first. At this point, the liver was firmly adherent to the diaphragm by inflammatory products, as, indeed, was the greater part of the right lobe, but the latter were much older adhesions than those around the wound. At this opening, a brass button was found with a portion of clothing attached. The missile, disfigured a very little, with an ordinary military coat button inverted, together with the cloth to which it was sewn, is represented by the wood-cut (FIG. 286). It was contributed, with notes of the case, by Assistant Surgeon H. Allen, U. S. A., from Lincoln Hospital.

FIG. 286.—Elongated rifle ball, somewhat disfigured, with an ordinary military button inverted, and the cloth to which it was sewn. *Spec.* 4151, Sect. I, A. M. M.

Case 17.—Private *Allman M. P*———, Co. C, 34th Virginia Regiment, aged 35 years, was wounded at Hatcher's Run, October 27th, 1864, and made a prisoner. He was taken to the field hospital of the 1st division of the Second Corps, where Surgeon William Vosburg, 111th New York Volunteers, noted the case (one of penetrating wound of the chest) and applied the necessary dressings, and administered restoratives, and, when the patient had rallied from the shock of the injury, sent him in an ambulance to the rear, whence he was conveyed on a hospital steamer to Washington, where he was admitted to Columbian Hospital, Washington, October 30th, 1864, with a "gunshot penetrating wound of the chest, received at Petersburg, Virginia, on the 27th. A minié ball entered the triangle of the neck, passed downward into the chest, fractured the first rib and partially the clavicle, and slightly injured the apex of the left lung." Acting Assistant Surgeon C. F. Lloyd, in charge of the ward, treated the case mainly on the expectant plan, with careful nursing, and palliative remedies to meet symptoms. The ball was out of reach, and Surgeon T. R. Crosby, U. S. V., in charge of the hospital, decided that an attempt to extract it was unwarrantable, as was clearly proved in the sequel. The patient suffered greatly from oppressed breathing and the usual complications of traumatic pleuro-pneumonia, especially from frequent painful cough. Concentrated sustaining nourishment was given, but the patient steadily grew worse, and death resulted on November 11th, 1864, from intermediary hæmorrhage. The necropsy showed rigor mortis great. Old pleuritic and diaphragmatic adhesions existed on the left side of the chest. There were about four ounces of clotted blood on the walls of the chest near the wound. The upper lobe of the left lung was atrophied and almost gangrenous in appearance. The adjoining wood-cut (Fig. 287) shows a wet preparation of the upper half of the left lung, with a conoidal ball embedded in its substance, partially blocking up the left pulmonary vein. It was contributed, with a memorandum of the case, by Acting Assistant Surgeon J. Fischer.

Fig. 287.—Ball lodged against pulmonary vein. *Spec.* 3388, Sect. I, A. M. M.

After the specimen had been hardened in alcohol, upon tracing the track of the wound from its entrance in the pleura at the posterior part of the upper lobe of the left lung, near the apex, downward and forward to the root of the lung, the larger of the two missiles figured in the wood-cut (Fig. 288) was found lying against the common trunk formed by the junction, in this case, of the two left pulmonary veins. There was a small jagged opening in the vein, whether produced mechanically after death, or by ulceration, could not be determined. The track of the wound was filled with coagula. Near by the larger missile, lying against the fibrous cord constituted by the remains of the *ductus arteriosus* was found a smaller misshapen fragmentary projectile, apparently a portion of a carbine ball. It was difficult to account for its presence, which had not been remarked in the examination of the specimen in its recent state. It had apparently entered through the same track as the larger missile, a track that was large and much lacerated. It is hardly possible that it could have been introduced *post-mortem* to freight the preparation, which submerged in alcohol by its own density. It was not a fragment of the larger ball, which, though battered and flattened by impact on the first rib, was entire and weighed 540 grains. Its presence in the already perplexing specimen was very puzzling.

Fig. 288.—Ball and fragment of ball removed from *Spec.* 3388.

Case 18.—Private Alexander J———, Co. K, 62d Ohio Volunteers, aged 33 years, was wounded at Deep Bottom, Virginia, August 16th, 1864, by a minié ball, which penetrated the right side of the thorax near the sternum. He was taken to the field hospital station of the 1st division of the Tenth Corps, where the wound was dressed and a chest bandage applied, and restoratives given. He was very faint and the breathing was labored. He was sent to City Point, and placed on the hospital transport Connecticut, in charge of Surgeon T. B. Hood, U. S. V., and conveyed to Philadelphia. On the 21st, he was admitted to the hospital at Beverly, New Jersey. Cold-water dressings were applied to the wound. He died December 21st, 1864, from empyema of the left side. At the necropsy the ball was found to have entered just above the sterno-clavicular articulation of the right side, passed downward and to the left, fractured the sternal end of the left clavicle, and, entering the chest, imbedded itself in the left lung, where it was found. The left pleural cavity contained about two quarts of pus, which compressed the lung so as to cause solidification of that organ. The pericardium was firmly adherent to the heart, and the liver and spleen were somewhat enlarged. The other organs were in a healthy condition. The adjacent wood-cut (Fig. 289) shows a wet preparation of the heart and left lung, with the model of a conoidal bullet *in situ*. Assistant Surgeon Woodhull remarks that "the specimen shows that neither speedy death nor pneumonia is a necessary consequence of gunshot wound of the lung;"* but the evidences of pulmonary as well as cardiac inflammation are unmistakable, though the fatal issue was so long delayed. The preparation was contributed, with a history of the case, by Assistant Surgeon C. Wagner, U. S. A.

Fig. 289.—Thickened and adherent pericardium and portion of left lung, with imbedded ball. *Spec.* 3736, Sect. I, A. M. M.

* *Catalogue of the Surgical Section of the Army Medical Museum*, 1866, p. 480. As leaden bullets in wet preparations rapidly oxidize and discolor the alcohol, I commonly replace them with a cast painted with dark insoluble varnish, and preserve the missile outside the jar.—Curator.

CASE 19.—Private J. J. P———, Co. B, 5th Wisconsin Volunteers, aged 24 years, was wounded at Chancellorsville, May 3d, 1863, by a conoidal ball, which entered between the sixth and seventh ribs, an inch outward of the mammillary line, grazing and fracturing the seventh rib. He was treated in the field hospital, and, on May 8th, was transferred to Douglas Hospital, Washington. When admitted, the patient was suffering from very severe dyspnœa, accompanied by an incessant, painful, and annoying cough; respiration was very frequent, forced, and superficial. He stated that he had spat blood after the injury, but not the least tinge of blood was observable in the thick frothy mucous expectoration. An abundant effusion in the left thoracic cavity easily accounted for the dyspnœa. Purgatives, diaphoretics, and stimulants were administered and counter-irritants applied over the left side of the chest, with water dressings to the wound. He died May 10th, 1863. At the *post-mortem* examination, sixteen hours after death, old adhesions were found in the right lung and fresh ones in the left. The effusion of sero-sanguinolent fluid in the left cavity was the immediate cause of death. Paracentesis thoracis would have proved of but little avail, as the diaphragm was perforated and the spleen and left kidney badly bruised and injured. The ball lodged parallel to the transverse process of the fourth lumbar vertebra, near the spine. The case was exceedingly interesting, because the patient had manifested no abdominal symptoms, had no blood in his urine, and voided it freely and without pain in spite of the extensive injury to the left kidney. The case is reported by Acting Assistant Surgeon Carlos Carvallo. The missile, with the merest contusion of the rings at one point, was forwarded to the Army Medical Museum by Assistant Surgeon W. Thomson, U. S. A., and is represented in the adjoining wood-cut (FIG. 290).

FIG. 290.—Ball weighing 510 grains slightly contused after passing through the thorax. *Spec.* 293, Sect. I, A. M. M.

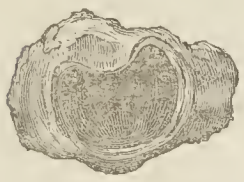

FIG. 291.—A conoidal ball removed from the mediastinum after death. Weight, 466 grains. *Spec.*2735, Sect. I, A. M. M.

CASE 20.—Private J. A. S———, Co. C, 145th Pennsylvania Volunteers, aged 19 years, was wounded at Gettysburg, Pennsylvania, July 2d, 1863, by a conoidal ball, which perforated the left scapula just below the spine, and passing forward to the right, splintered the sternal end of the first rib. He was conveyed to the hospital of the 1st division, Second Corps, and, on July 9th, admitted to McKim's Mansion Hospital, Baltimore, where he died on the same day. At the autopsy the ball was found compressed upon itself in the anterior mediastinum, opposite the first intercostal space. The apex of the left lung was engorged and the left pleura contained about two quarts of sero-sanguinous fluid. Miliary cysts filled with pus were seen at the apex of the right lung. The specimen is represented in the adjoining wood-cut (FIG. 291). The history was contributed by Acting Assistant Surgeon R. H. Stirling.

CASE 21.—An unknown soldier, wounded at the battle of Gettysburg, was brought into one of the field hospitals, in an insensible state, with a wound under the malar bone. The ball had taken a downward course through the neck into the thoracic cavity, and could not be traced. Pulmonary symptoms arose, and the patient lingered till August 7th, when he died, and, at the autopsy, the missile, a misshapen conoidal, with bony spiculæ imbedded in it, was found in the posterior mediastinum, behind the arch of the aorta. The projectile is represented by the wood-cut (FIG. 292). It was contributed to the Museum by the curator, Surgeon J. H. Brinton, U. S. V.

FIG. 292.—Misshapen conoidal ball lodged in mediastinum after traversing neck. *Spec.* 1439, Sect. I, A. M. M.

To the eight foregoing abstracts of cases of foreign bodies removed from the cavity of the chest after death, should be added some examples of the extraction of the missiles during life.

In the five following cases, projectiles were excised from the thoracic parieties; in one instance, after being encysted for fourteen months:

FIG. 293.—Ball studded with particles of bone from scapula. Weight, 483 grains. *Spec.* 1422, Sect. I, A. M. M.

CASE 22.—Private Hugh Meehan, Co. A, 63d New York Volunteers, was wounded at Gettysburg, July 2d, 1863, by a ball which entered the right side, between the second and third ribs, passed around to the inner border of the scapula and lodged, injuring the edge of the bone to some extent. He was sent from the field hospital of the 1st division, Second Corps, to Patterson Park Hospital, Baltimore, where the ball was extracted on July 31st, 1863, through a counter incision. The wound healed kindly, and Meehan was returned to duty December 11, 1863. The operator, Acting Assistant Surgeon A. T. Pick, presented the missile, represented in the wood-cut (FIG. 293), to the Museum.

FIG. 294.—Conoidal ball laterally flattened, with the apex blunted by impact on the scapula. *Spec.* 3174, Sect. I, A. M. M.

CASE 23.—Private Joseph Fouracre, Co. B, 1st Delaware Volunteers, was wounded at Antietam, September 17th, 1862, by a ball, which struck the scapula and buried itself in the muscles. Its position was detected, and it was extracted on September 24th, the date of the patient's admission to McKim's Hospital, Baltimore. There were some exfoliations from the scapula, and the wound healed tardily, but ultimately cicatrized firmly, and the patient was returned to duty on June 16th, 1863. The projectile, represented by the wood-cut (FIG. 294), was sent to the Museum by the operator, Surgeon Lavington Quick, U. S. V.

FIG. 295.—Conoidal ball roughened by impact with spine of scapula. *Spec.* 4434, Sect. I, A. M. M.

CASE 24.—Assistant Surgeon J. B. Brinton, U. S. A., contributed the specimen figured in the accompanying wood-cut (FIG. 295) to the Museum, without further information than that it was cut out from the supra-scapular fossa, where it lay partly impacted in the spine of the scapula, in the case of a soldier of the Army of the Potomac, wounded before Petersburg. This wound healed without ill consequences.

CASE 25.—Private H. Millineth, Co. E, 9th New York Zouaves, was wounded at Roanoke Island, February 8th, 1862, by a round musket ball, which entered beneath the anterior convexity of the clavicle and buried itself in the soft tissues. The wound healed without trouble, the ball becoming eneysted. Millineth entered Armory Square Hospital, at Washington, a year afterward, with typhoid fever. When convalescent, the ball was detected in the supra scapular fossa, and was excised, April 28th, 1863. The man was discharged, well, May 4th, 1863, on the expiration of his term of service. Surgeon D. W. Bliss, U. S. V., presented the specimen, figured in the wood-cut (FIG. 296).

FIG. 296.—Round ball extracted from supra scapular fossa, fourteen months after injury. *Spec.* 4488, Sect. I, A. M. M.

CASE 26.—Private Julius Wilt, Co. A, 45th New York Volunteers, aged 22 years, was wounded at Gettysburg, July 1st, 1863, by a minié ball, which entered to the right of the second lumbar vertebra, passed between the skin and cellular tissue, and lodged two inches to the right of the umbilicus. He was taken to the 4th division hospital, where, on the 12th, the missile was cut out. He had also a ragged wound below the right nipple, which appeared to implicate only the soft textures. The treatment consisted of tonics, with simple dressings to the wound. The wound of the back soon cicatrized; that of the chest continued to discharge. The patient became weak and prostrate, but improved under the administration of stimulants and tonics. On November 7th he was transferred to Newton University Hospital, Baltimore, at which time the wound of exit had not healed. On March 2d, 1864, Surgeon C. W. Jones, U. S. V., made an incision one and a half inches in length in the side and removed a piece of shell one and three-fourths by one and one-fourth inches, and which weighed one and one-fourth ounces. The presence of this missile had not been suspected for a long time. The wound soon afterward healed. and he was transferred to De Camp Hospital, New York Harbor, whence he was returned to duty on September 27th, 1864. The fragment of shell was contributed to the Museum, with the above notes, by the operator, and is represented of the natural size in the adjoining wood-cut (FIG. 297).

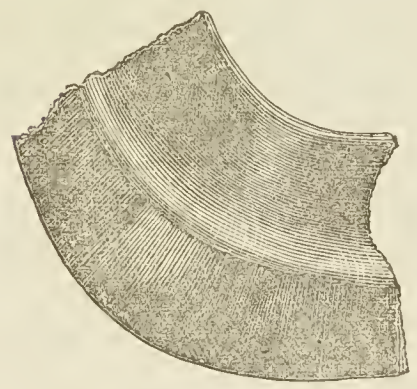

FIG. 297.—Fragment of shell removed from the right side, eight months after injury. *Spec.* 4503, Sect. I, A. M. M.

Eighty-eight abstracts of cases attended by the lodgement of balls or other foreign bodies will be found recorded between page 473 and page 582, or the beginning of this sub-section. In over one-third of the cases, or thirty-three, the foreign bodies were extracted, either immediately or within twenty days in eleven cases, and at periods ranging from one to twenty-two months in the remainder. Twenty of these thirty-three patients recovered. In seven of the twenty, the missiles had probably not penetrated beyond the thoracic walls; seven were examples of perforation of the chest and the removal of the ball from lodgement beneath the integument or scapula; in one, the famous case of Betts (PLATE X), the projectile was removed from the mediastinum, and the five remaining cases, of Kuhn, Knowles, Tomlinson, *Branson*, and Rabell, were believed to be examples of wounds of the lung tissue.

Of the twenty-six abstracts included in this subsection thirteen relate to the extraction of missiles or foreign bodies during life. One other example may be cited in detail, and the other cases of this description that appear on the returns must be considered numerically.

CASE 27.—Private Francis Cook, Co. K, 2d Michigan Volunteers, was wounded at Bailey's Cross Roads, Virginia, September 4th, 1861, by a conoidal ball, which penetrated the lungs. Surgeon William O'Meagher, 37th New York Volunteers, in a report of the case in *Am. Med. Times*, Vol. IV, p. 6, says: "While on picket duty near the Cross Roads, he received from the enemy's picket a gunshot wound through the lungs, and when discovered by his comrades, who had hastened to the spot, was found faint from profuse hæmorrhage, and lying on the wounded side. By them he was conveyed in a blanket to the main body stationed at the Cross Roads, the distance being about a mile, and on their arrival I saw him immediately. On examination, his clothes behind were found saturated with blood, while several large clots were removed from the immediate vicinity of the wound. As he was extremely prostrated, some stimulants were gradually administered until reaction took place, and, in the meantime, I was searching for the exit of the bullet, which had entered the left side posteriorly, fracturing the tenth rib and making a large irregular wound. On introducing my finger for about two inches for the purpose of exploring and removing foreign substances, I felt the lung tissue, and found the wound itself partially filled with coagula and extending toward the opposite side in a transverse direction; emphysema appeared to some extent in the vicinity. I did not attempt a further exploration, especially as the wound, as far as I could discern, appeared free from foreign substances and partially closed. Shredded lint was then applied to the wound, and the patient gently turned over on the wounded side. On searching for the exit of the ball, the only indication of its presence was a patch of emphysema on the opposite side, somewhat higher up than the aperture, but the ball itself could not be felt, so I resolved to wait awhile in order to allow the patient to recover somewhat, hoping that, in the meantime, the respiratory efforts, increased by a pretty tight bandage, would force the ball outward and thus render it palpable. Accordingly,

in about four hours, he began to experience severe pain in this part, and on removing the bandage, at the same time directing him to take a full breath, which he did with ease and evident relief, I was exceedingly gratified to find the ball presenting itself in the sixth intercostal space. On cutting down I found it firmly imbedded in the costal pleura, and after a little delay, occasioned by a desire not to make a large opening, removed it with a common forceps, and immediately closed the wound with interrupted sutures. The bandage was again applied, and a full anodyne administered, after which he slept well for two hours and felt very much relieved. The missile, contrary to my first anticipations, turned out to be a small triangular-shaped rifle-bullet, irregular and rough at the edges, as if it were so designed to produce greater mischief. He continued very comfortable for two days, taking light nourishment and appearing quite cheerful and intelligent, occasonally only being attacked with dyspnœa, which, however, was never sufficient to cause any apprehension. Obedient to directions, he lay perfectly still, without talking, except in answer to a necessary question as to his condition. His bed was a canvas field-stretcher, with poles inserted into the folded canvas, which was also attached to the end pieces by buttons and cords. The iron framework at the ends raised it from the ground sufficiently to afford a safe, easy, and efficacious means of transportation, far superior, in my opinion, to any other thus far presented, and certainly better than field ambulances over rough roads. On this he was conveyed, on the third day, a distance of perhaps ten miles, to the general hospital in Alexandria, where he died on the fifth day. I am indebted to Dr. H. Laurence Sheldon, the surgeon in charge, for the following record of the autopsy: 'Left side of chest filled with bloody serum; lung compressed, and a space between anterior parietes and surface of lung filled with air. Lymph covered the visceral and parietal pluræ, and clots of blood were on the most dependent portion of the cavity. The ball struck the tenth rib, fracturing it three inches from its articulation with vertebræ, passed through the lower lobe of left lung, where there was intense inflammation in its track, with numerous spiculæ of bone carried two inches into substance of lung from the fractured rib, thence through body of tenth vertebra, through diaphragm and upper surface of liver, a distance of two inches; again through diaphragm, and was removed externally between sixth and seventh ribs. There was a patch of pneumonia on the right lower lobe. Half a gallon of serum and blood was taken from both pleural cavities.' I should have mentioned as rather remarkable, that for three days, though he had considerable dyspnœa, and pain referred to in both places, he had neither cough nor expectoration until the fourth day, leading some to suppose that both lungs were not seriously wounded, as I had at first reported, the ball rather making a circuit *outside* the lung. But I think it almost impossible that the right lower lobe could escape when the ball passed *twice* through the diaphragm and upper surface of the liver, being finally removed from the *sixth* intercostal space; besides, 'there was a patch of pneumonia on the right lower lobe, and half a gallon of serum taken from *both* pleural cavities.'"

Besides the forty-seven cases of extractions of balls or foreign bodies from the thoracic walls or cavity that have been cited with some details, were two hundred and sixty-nine, of which only the results can be noted. In the aggregate of three hundred and sixteen operations, a fatal termination ensued in one hundred and eight cases; in one hundred and nineteen cases, the patients were discharged with various degrees of disability, and eighty-one recovered sufficiently to resume duty, at least temporarily. Forty-one of the recoveries are found among cases in which the projectile was lodged beneath the soft parts, without having injured the contents of the chest. The remaining two hundred and seventy-five were attended either by fracture of the ribs, or presumed injury of the contents of the thorax. Of these patients, one hundred and eight are known to have died; in eight cases, the result is unknown; and there remain one hundred and fifty-nine examples, or more than one-half, of reported recoveries. As the names of the majority are found on the pension roll, there can be little doubt of the fact of recovery; but there is every reason to believe that the gravity of the injury was overestimated and that many cases returned as penetrating wounds of the chest, in reality were wounds of the parieties only.

That there were a certain number of recoveries after extraction of balls from the pulmonary parenchyma cannot be denied, but there is a lamentable deficiency in details in the reports of this most important class of injuries.* It must be very rarely that any attempt should be made to discover and extract balls lost and lodged in the tissue of the lung. It is safer to abandon such to the care of nature. LeDran points out a rare exception to this precept, which presents itself, by a happy chance, when from a former pleurisy the wounded lobe is firmly adherent to the walls of the chest. In all other cases, Percy and Desport and Bagieu, who cannot be accused of timidity, advise against attempts

*Larrey, D. J., *Mém. de Chir. Mil.*, Paris, 1817, T. IV, p. 261; Lohmeyer, *Die Schusswunden und ihre Behandlung*, Göttingen, 1859, p. 124; Rust, J. N., *Handbuch der Chirurgie*, Berlin, 1836, Band 17, S. 622; Baudens, *Clinique des plaies des d'armes à feu*, Paris, 1836, p. 242; Fabricius Hildanus, *Observationes Chirurgicæ*, Cent. I, Obs. 46; Stromeyer, *Maximen der Kriegsheilkunst*, Hannover, 1861, p. 432; Thomassin, M., *Dissertation sur l'extraction des corps étrangers des plaies, et specialement de celles faites par armes à feu*, Strasb., 1788.

at extraction. M. Demme, on the other hand (*Militär-chirurgische Studien*, Zweite Abth., S. 138, Würzburg, 1864), says: "Entirely unfounded is the fear of a careful examination for the seat of lodgement of the projectile. A systematic search should be made in the direction of the wound, which should be ascertained by the finger or the probe." Dr. Pirogoff[1] (*Grundzüge der allgemeinen Kriegschirurgie*, Leipzig, 1864, p. 534) severely criticises these precepts of Dr. Demme. Professor Gross (*A System of Surgery*, 5th ed., Vol. II, p. 446) teaches that "any foreign substance that may be present should be promptly removed, provided it is easily accessible; for the rule here, as in all other visceral cavities, is to refrain from officious interference." No one will question the propriety of extracting accessible foreign bodies; but there will be differences of opinion as to what constitutes officious interference. It is, perhaps, impossible to formulate the general rule more precisely than is done in the language of this learned author; but the whole question at issue is involved in the interpretation of the rule. I cannot subscribe to the next sentence: "Nothing, in such a condition, can more clearly betray the ignorance of the surgeon than the introduction of the probe into the chest; a careful exploration of the outer wound is always admissible, especially when suspicion exists that a rib has been fractured, or that a ball has lodged in one of the intercostal spaces." Dr. Demme, Dr. Cooper, and M. Legouest, are assuredly neither ignorant nor inexperienced, and the case of Dr. Ellis (Lewis, p. 494) alone proves the propriety of undertaking, under some circumstances, very serious operations for the removal of foreign bodies from the lung. The dogmatic teaching of Dupuytren,[2] has probably exerted much influence upon modern practice in this connection. He said: "Une blessure de poitrine par armes à feu qui traverse le poumon ne doit jamais être sondée, c'est la plus grave hérésie que l'on puisse commettre en chirurgie, et l'instrument dit *sonde de poitrine*, que l'on trouve dans les trousses des chirurgiens, devrait bien être banni, au moins pour ces sortes de lésions." To this, M. Legouest replies, at page 357, of the last edition of his *Traité de Chirurgie d'Armée:* "Les faits sont en complet désaccord avec ce précepte: le seul inconvénient auquel on s'expose en sondant une plaie de poitrine par coup de feu que l'on suppose renfermer un corps étranger, est de ne pas trouver ce que l'on cherche. En effet, ou bien le poumon libre d'adhérences s'est rétracté vers sa racine et échappe à l'instrument explorateur qui parcourt sans obstacle la cavité pleurale; ou bien le poumon est adhérent à la plèvre costale et sa blessure reste en rapport avec la plaie extérieure. Dans ce dernier cas, une sonde de poitrine ou une sonde de gros calibre de gomme élastique peut être introduite dans le trajet escharifié de la plaie du poumon, sans courir le risque de causer une irritation plus vive que la présence de la balle, d'esquilles, de vêtements ou d'autres corps entraînés par le projectile. Si l'on était assez heureux pour rencontrer le corps étranger dans le poumon, il faudrait, comme le conseille Ledran, dilater suffisamment la plaie extérieur pour aller le saisir avec des pinces et l'extraire sans obstacle." The general opinion among military surgeons in the war of the Rebellion appeared to be that it was always well to complete the diagnosis, for nothing can be better than the entire truth;

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[1] He also adverts (*l. c.* S. 549) to the remarkable operation by Dr. Cooper, of San Francisco: "Of desperate operations successfully performed for injuries of the chest, few are worthy of imitation. Nearly all concern the removal of foreign bodies from the cavity of the chest. A few of these adventurous operations resulted successfully. One of the most desperate comes to us again from America. It is a case related by Dr. E. S. Cooper (of San Francisco), in 1857." See COOPER, E. S., *Report of an operation for Removing a foreign body from beneath the Heart.* (Published by the San Francisco Medico-Chirurgical Association as an additional paper to its *Transactions* for the year 1857). Dr. W. F. Atlee (Am. Jour. of Med. Sci., N. S., Vol. XXXV, p. 229) remarks of this operation that "it is extraordinary even for California, that land of enormities of every description."

[2] DUPUYTREN, *Leçons orales de clinique chirurgicale*, T. VI, p. 382.

but when the means of arriving at it might do more harm than the knowledge of it could do good, it was the part of wisdom to know when to be willing to remain in doubt. The authors of the Confederate *Manual*[1] declare that "if the presence of a ball within the cavity be ascertained, efforts should be made for its removal. But any attempt to determine where the ball has lodged should be made very cautiously, as more harm may result from the interference than from the lodgement of the foreign body." Examples have been cited (p. 481, *et seq*) of the fatal consequences of the rash and unwarrantable explorations that the authors that have been quoted and others reprehend; but surely there is a wide interval between such meddling and the judicious use of the probe and forceps in cases in which there are just grounds for suspecting the presence of a foreign body, and the sagacious practitioner will neither discard the probe absolutely nor use it habitually. It is almost needless to repeat that all good surgeons agree that the finger is the best probe whenever available.

The surgeon will remember that a ball striking the chest may lodge in the soft parts near the point of impact,[2] or be deflected to distant parts,[3] or it may be impacted in a rib,[4] or wedged in an intercostal space,[5] or lodged in the sternum[6] or spine,[7] or against the clavicle[8] or scapula;[9] or it may fracture the rib and push the costal pleura before it and not penetrate the cavity;[10] or, penetrating the cavity, it may lodge either in the walls or in the contained viscera or in the cavity, or pass out of the cavity and make a wound of exit, or else lodge under the skin, scapula, or soft parts near its emergence from the thorax. Perhaps it would be best to restrict the term *perforating* gunshot wounds of the chest to the cases comprehended in the two latter subdivisions. The ball may perforate the chest through intercostal spaces without fracture, or there may be fracture at the point of impact and not at the point of egress, or the reverse; or the ball may traverse the mediastina or both sides of the thorax, or enter the chest by pushing aside the cartilages; or, lastly, it may penetrate through the neck or diaphragm, as has often occurred since the use of arms of long range has frequently justified the adoption of the prone position under fire. The ball may carry with it various extraneous matters, or portions of the bony case it has encountered in entering. Examples of nearly all of these various forms of injury have been enumerated and others will be found in TABLE XXII.

I avail of the remaining space to introduce illustrations of four other specimens, the histories of which are briefly as follows: FIG. 298 represents a missile which struck Corporal S. M. Elder, Co. K, 10th Pennsylvania Volunteers, at Fredericksburg, December 13th, 1862, in the third right intercostal space, and was extracted, January 19th, 1863, by Surgeon O. A. Judson, U. S. V., near the lower angle of the scapula. Elder recovered and was pensioned. FIG. 299, represents a *post-mortem* specimen found in the body of Lieut. H. H. W——, Co. D, 6th Maine, wounded at Rappahannock Station, November 7th, 1863, the ball fracturing the sternum and first rib and entering the apex of the lung. The case terminated fatally in six days. FIG. 300 represents a heavy ball extracted December 21st, 1862, from near the spine of the left scapula by Assistant Surgeon W. A. Conover, U. S. V., having entered December 13th, 1862, in the third left intercostal space anteriorly in the case of Private J. Porret, Co. B, 105th Pennsylvania, wounded at Fredericksburg, who subsequently recovered and was discharged. FIG. 301 represents a projectile that passed through the chest of a soldier at Gettysburg, and then lodged deeply in the soft parts of the man behind him, whence it was extracted by Acting Assistant Surgeon B. B. Miles.—COMPILER.

FIG. 298.—A conoidal ball of unusual slenderness. The two lower thirds are compressed on one side and bear markings as if of the texture of coarse cloth. *Spec.* 4657, Sect. I, A. M. M.

FIG. 299.—An elongated rifle ball somewhat blunted and flattened upon one side in which small fragments of bone are imbedded, with one and a half inches of brass wire hooked in the apex. *Spec.* 2651, Sect. I, A. M. M.

FIG. 300.—Ball weighing 840 grains, with the body flattened obliquely and two short lateral grooves near the apex. *Spec.* 4399, Sect. I, A. M. M.

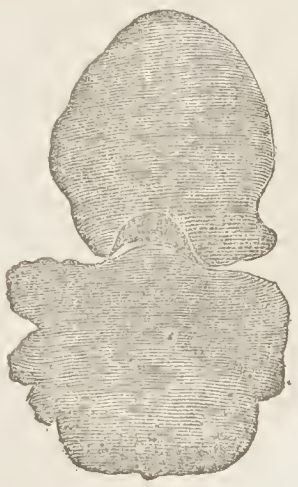

FIG. 301.—Ball split in traversing the chest. Weight, 684 grains. *Spec.* 573, Sect. I, A. M. M.

[1] *A Manual of Military Surgery*, prepared for the use of the Confederate States Army, by order of the Surgeon General, Richmond, 1863, p. 60.

[2] See page 473. [3] Besides the examples given, see HENNEN (*l. c.*, p. 392), GUTHRIE (*l. c.*, p. 464). [4] Page 569. [5] Page 568. [6] Page 474. [7] Chapter IV, p. 460. [8] Page 475. [9] Page 476. [10] See a remarkable case related by D. J. LARREY (Jour. Gén. de Méd., T. LXXII).

TABLE XXII.

List of Specimens contained in the Army Medical Museum of Balls or Foreign Bodies removed from the Walls or Cavity of the Chest during Life.

No.	Number of Specimen.	Name of Patient.	Nature of Missile.	Date of Injury.	Date of Extraction.	Whence Extracted.	Termination of Case.	Reference.	Remarks.
1	4400	McMurtree	Conoidal ball	Dec. 13, 1862	Dec. 20, 1862	Parietes, over shoulder-blade	*Feb. 5, 1863	Fig. 207, p. 473.	Cavity not penetrated.
2	4558	Kearney	Conoidal ball	July 1, 1862	Spring, 1864	Lower portion of body of sternum	Discharged	Fig. 208, p. 474.	Cavity not penetrated.
3	378	Berry	Elongated ball	Dec. 12, 1862	Dec. 12, 1862	Parietes subclavicular region	Discharged	Fig. 210, p. 474.	Cavity not penetrated.
4	178	F——	Two fragments of conoidal ball.	Aug. 30, 1862	Sept. 3, 5, '62	Parietes; fractured scapula	†Sept. 25, 1862	Fig. 213, p. 476.	Fractured scapula.
5	1579	Howard	Elongated smooth-bore ball	July 2, 1863	July 22, 1863	Parietes near inferior angle of left scapula.	‡Aug. 14, 1865	Fig. 214, p. 480	Cavity penetrated; lodged near scapula.
6	4479	McCaleehu	Round ball	Aug. 28, 1862	Sept. 15, 1862	From beneath integument	‡Dec. 1, 1862	Fig. 230, p. 489	Cavity penetrated.
7	1211	B——	Conoidal ball split in two	May 3, 1863	May 14, 1863	From substance of infraspinatus mus.	†May 25, 1863	Fig. 260, p. 563.	Excision of portion of scapula.
8	2294	M——	Conoidal ball	May 6, 1864	May 17, 1864	From spine of scapula	‡Sept. 14, 1865	Fig. 262, p. 563	Excision of portion of scapula.
9	4530	Fisher	Conoidal ball	July 1, 1863	July 4, 1863	Walls of chest	*Aug. 12, 1863	Fig. 266, p. 567.	Removal of a piece of rib; cavity not penetrated.
10	1561	C——	Conoidal ball	Nov. 5, 1864	Aug. 18, 1865	From behind tenth rib, left side	†Aug. 20, 1865	Fig. 271, p. 568	Lung injured. Fracture of rib.
11	4509	Baxter	Iron ball	July 2, 1863	May 3, 1864	From under pectoral muscle	*Sept. 28, 1864	.....	Cavity not penetrated.
12	4538	Unknown	Grape shot	June 29, 1862	Same day	Left axilla	Unknown	.....	Second and third ribs fractured; cavity not penetrated.
13	4503	Wilt	Fragment of base of shell	July 1, 1863	Mar. 2, 1864	Parietes near umbilicus	Discharged	Fig. 297, p. 590	Cavity not penetrated.
14	4657	Elder	Conoidal ball	Dec. 13, 1862	Jan. 19, 1863	Near inferior angle of scapula	Discharged	.....	Lung perforated.
15	4297	Soldier of 4th N. Y. Cav.	Fragment of carbine ball	June 13, 1862	June 13, 1862	Parietes near middle 3d of clavicle	Unknown	.....	Lung perforated.
16	4536	Kaiser	Spherical ball	May 3, 1863	July 15, 1863	Between ribs and scapula below spine	Recovered	.....	Cavity not penetrated.
17	4399	Rinet	Heavy conoidal ball	Dec. 13, 1862	Dec. 21, 1862	Below superior angle left scapula, near spine.	Discharged	.....	Cavity perforated.
18	1587	Leavitt	Conoidal ball	June 15, 1864	June 20, 1864	Over third rib, near left axilla	†July 12, 1864	.....	Cavity penetrated.
19	1422	M——	Conoidal ball	July 2, 1863	July 31, 1863	Inner border of scapula	Recovered	.....	Cavity not penetrated.
20	4573	De La Fontaine	Cup portion of conoidal ball	Sept. 17, 1862	Sept. 24, 1862	Over sixth rib, to left of sternum	‡Oct. 27, 1862	.....	Extra thoracic.
21	563	Lawrence	Conoidal ball	Nov. 7, 1863	Nov. 10, 1863	Parietes, near right nipple	†Nov. 16, 1863	Fig. 278, p. 583	Cavity penetrated.
22	4427	Terry	Conoidal ball	July 1, 1863	Oct. 10, 1863	Under intercostal muscles	‡Sept. 7. 1864	.....	Cavity penetrated; rib fractured.
23	4535	Ford	Elongated rifle ball	Sept. 17, 1862	Jan. —, 1863	Beneath spine of scapula	Recovered	.....	Cavity not penetrated.
24	1443	White	Elongated ball	May 31, 1862	June 9, 1862	Near inferior angle of scapula	*Oct. 6, 1862	.....	Cavity not penetrated.
25	3240	Skillet	Split conoidal ball	May 3, 1863	Oct. 10, 1863	Right supraspinous fossa	Recovered	.....	Cavity not penetrated.
26	4466	Stante	Conoidal ball	June 17, 1862	Aug. 1, 1862	Near spine of eighth dorsal vertebra.	Recovered	.....	Cavity not penetrated.

27	4491	Leighton	Conoidal ball	Nov. 7, 1863	Nov. 10, 1863	Left of spine of third dorsal vertebra	Recovered		Cavity not penetrated.
28	4551	Phelps	Conoidal ball	Aug. 9, 1862	Aug. 15, 1862	Infraspinous fossa	Recovered		Cavity not penetrated.
29	4513	Sterling	Fragment of shell	April 30, 1863	April 13, 1864	Near spine of left scapula	Recovered		Cavity not penetrated.
30	1598	Saxon	Spherical ball	May 3, 1863	May 14, 1863	Below middle third of clavicle	*Oct. 29, 1863		Cavity not penetrated.
31	4488	Millenet	Round ball	Feb. 8, 1862	April 28, 1863	Under scapula	Recovered		Cavity not penetrated.
32	4534	Barrett	Spherical ball	July 1, 1863	July —, 1863	Near spinal column	Duty		Cavity not penetrated.
33	4532	Bogart	Conoidal ball	July 3, 1863	July —, 1863	Over seventh rib, near spine	Recovered		Cavity not penetrated.
34	4528	Litch	Conoidal ball	Dec. 13, 1862	Dec. —, 1862	Inferior angle of scapula	*Dec. 1, 1863		Cavity not penetrated.
35	4524	Kern	Conoidal ball	July 1, 1863	July 24, 1863	Centre of axillary space	*May 3, 1864		Cavity not penetrated.
36	4487	Walter	Conoidal ball	Aug. 30, 1862	Sept. 5, 1862	Over border of scapula	Discharged		Cavity not penetrated.
37	4526	Dasenbouck	Portion of bullet	July 1, 1863	July 3, 1863	Over middle of clavicle	*Aug. 17, 1863	Fig. 27, p. 92	Cavity not penetrated.
38	1131	Genthard	Elongated rifle ball	July 3, 1863	July 28, 1863	Under pectoralis major muscle	‡May 12, 1864		Cavity not opened.
39	1448	Grothenn	Conoidal ball	June 9, 1863	June —, 1863	Near shoulder joint	Died	See p. 545	Cavity not opened; ligation of subclavian artery.
40	4734	Spencer	Pistol ball	May 3, 1867	Same day	Thoracic parietes—glanced from costal cartilage.	Recovered		Cavity not opened.
41	2432	Morrison	Elongated ball	Aug. 9, 1862	Oct. 18, 1862	Below middle of spine of scapula	Recovered		Excision head of humerus; cavity not opened.
42	3953	Smith	Elongated rifle ball	July 2, 1863	July 22, 1863	Dorsal region	Recovered		Cavity not opened.
43	4421	Robinson	Elongated smooth-bore bullet.	July 3, 1863	Sept. 27, 1863	Between scapula and ribs	Recovered		Cavity not penetrated.
44	4508	Quint	Conoidal ball	Dec. 13, 1862	Dec. 20, 1862	Near inferior angle of scapula	Recovered		Cavity not penetrated.
45	4505	Flansburg	Conoidal ball	Aug. 30, 1862		Clavicle	Discharged		Cavity not penetrated.
46	404	Lee	Conoidal ball	May 3, 1863	May 24, 1863	Lower angle of scapula	Duty		Cavity not penetrated.
47	1494	Johnsou	Conoidal ball	Nov. 7, 1863	Nov. —, 1863	Inferior angle of scapula	Died		Cavity not penetrated.
48	1395	Foss	Conoidal ball	Nov. 7, 1863	Nov. —, 1863	Lower angle of scapula	Recovered		Cavity not penetrated.
49	1820	Creamer	Conoidal ball	Sept. 12, 1863	Oct. 31, 1863	External border scapula	Duty		Cavity not penetrated.
50	3192	Cramer	Conoidal ball	Nov. 27, 1863	Dec. 7, 1863	Over fifth rib	Recovered		Rib fractured; cavity not penetrated.
51	4575	Matthews	Conoidal ball	July 1, 1862	Aug. 11, 1862	Above posterior inferior angle of scapula.	Discharged		Lung wounded.
52	5968	Apple	Conoidal ball	May 20, 1863	Same day	Behind and a little below the axilla.	Discharged	Fig. 276, p. 582.	Lung wounded.
53	5956	Holmes	Fragment of brass button	Jan. 15, 1865	Jan. 9, 1872	Parietes above right nipple	Discharged	Fig. 277, p. 582.	Lung wounded.
54	1678	C——	Carbine ball	Aug. 1, 1863	Aug. 2, 1863	Parietes below inferior angle of the left scapula.	Died	Fig. 279, p. 583.	Lung wounded.
55	4868	Millrion	Conoidal ball			Border of left scapula	Discharged		
56	5964	McNamara	Conoidal ball	June 17, 1864	Dec. 22, 1871	Axilla	Discharged		Lung perforated.
57	4455	Private 5th Infantry.	Iron arrow-head	—— —, 1860	3 months after	Base of spine of scapula	Unknown		

* Duty. † Died. ‡ Discharged.

Several examples of balls or other foreign bodies remaining within the cavity of the chest for seven or eight years, have been related. Sufficient time has not elapsed since the war to afford parallel instances to those recorded by Larrey and Hennen and Guthrie, and those readers whose appetite for the marvellous is not appeased by the two following abstracts must be referred to the works of those authors and of others cited in the foot-note:*

CASE.—Henry Miltenberger, Co. K, 12th Ohio Cavalry, aged 20 years, was injured, June 9th, 1864, at Mount Sterling, Kentucky. In a report in the *Medical and Surgical Reporter*, Vol. XVI, p. 404, Dr. A. Geiger of Dayton, Ohio, says: "He was struck, at Saltville, Va., April 7th, 1864, by a minié ball in the left side; the ball entered at the lower margin of the seventh rib on a line parallel with the axilla. He bled severely at the time, but refused to be carried to the hospital, and remained with his comrades in camp, and after five days started on horseback with General Stoneman's brigade into Georgia, South Carolina, etc., and continued with his regiment until the close of the war. He states that after the healing of the wound externally he did not experience much inconvenience, except occasional shortness of breath and inability to perform active exercise, such as fast walking, running, etc. After being discharged from the army, he returned home and engaged in work at his trade, that of a carpenter, and continued to enjoy tolerable good health, until, some time in September, 1866, he contracted, by exposure, a severe cold, since which time he has had some cough and frequent expectoration of blood. Also, at times, complete aphonia, with sense of suffocation. One of these attacks was so severe as to produce spasms and insensibility, which continued for several hours. Oftentimes, during a severe fit of coughing, accompanied sometimes by vomiting, he would feel the presence of a hard body in the wind pipe, which he could almost at the time cough up. On the 26th day of March, 1867, after having been at work during the forenoon, he felt so unwell at noon that he returned home, and, in a short time afterward, was taken with a severe fit of coughing and soon expectorated a minié ball, weighing three-fourths of an ounce and the one that, nearly three years previous, had entered the left side. The ball was covered entire with a tough mucous coat, and the small cavity at the base was filled with pus. Considerable hæmorrhage followed the expectoration of the ball, but the relief he experienced was so great that he rejoiced to be rid of his unpleasant companion that for so long a time had been the occasion of so much discomfort. He still continues to expectorate small quantities of blood and bloody mucus, but he considers himself so much better that he is engaged in working at his trade, and he is of the opinion now that all will soon be right with him. It might be idle to speculate as to where this ball has been during this long period, and the course it may have traveled to find its way into the bronchi, and then to the trachea, or it may at first have lodged in the bronchia; but it is a remarkable instance of the '*vis medicatrix naturæ*,' in an otherwise healthy young man, and of the surprising efforts nature will sometimes make to rid herself of an incumbrance that would interfere with the normal action of her functions." In his declaration for pension Miltenberger states that a ball entered his right lung and lodged, and was coughed up in February, 1866. Said wound has caused disease of the lung with constant pain, and at night he cannot sleep on account of almost constant coughing. In a second declaration he states that he was treated in the hospital at Lexington, Kentucky, for two months; was home on furlough for thirty days; was afterwards treated in hospital at Camp Dennison, Ohio, where he remained until March, 1865, when he was returned to his regiment for light duty. Pension Examiner C. McDermont, Surgeon National Military Asylum, Dayton, Ohio, under date of January 26th, 1871, states that the applicant came under his charge in the winter of 1866-7, at Dayton. When called to see him he was suffering from intense dyspnœa and had to be constantly propped up in bed. The symptoms were those of pneumonia. During the treatment, he expectorated a ball in connection with bloody mucus and pus, and soon afterward recovered so that in the following summer he was engaged working at his trade. He occasionally called to see him about his lung, which he stated was, at times, so painful as to prevent his working. He was not present when Miltenberger threw up the ball, but saw him a few hours afterward, and all the circumstances of the case, especially the marked relief which the discharge of the ball brought, after about four days of intense suffering from dyspnœa, compelled him to believe that the attack was due to the presence of the ball in the lung." The application for pension is still pending. The official reports in this case are briefly as follows: That the applicant was injured at Mount Sterling, Kentucky, June 9th, 1864, "by the falling of a horse," signed by Surgeon George W. Brooks, 12th Ohio Cavalry; that he was admitted to general hospital at Lexington, Kentucky, June 12th, 1864, with "contusion of muscles of the back,—kick of a horse, received at Mount Sterling,—returned to duty June 23d, 1864," signed by Acting Assistant Surgeon Robert Peter; "admitted to regimental hospital, July 19th, 1864, with diarrhœa; sent to general hospital, July 24th, 1864," signed by Surgeon G. W. Brooks; admitted to Lexington general hospital with "inguinal hernia in right iliac region, by a kick from a horse; furloughed September 18th, readmitted October 16th, transferred October 17th, reported at Camp Dennison, Ohio, October 26th, 1864," signed by Acting Assistant Surgeon Robert Peter; "admitted to Camp Dennison, October 26th, 1864, with inguinal hernia; furloughed for twenty days, February 22d, 1865; readmitted March 18th,

* DELIUS, of Erlangen (*Amœnitates Medicæ circa casus medico-practicos haud vulgares*, Lipsiæ, 1747, Vol. V, p. 154), speaks of a soldier coughing up a ball long after the reception of the injury. REVEILLÉ-PARISE, *Deux observations sur des corps étrangers qui ont séjourné dans la poitrine à la suite des plaies pénétrantes de cette partie*; in *Arch. Gén. de Méd.*, Mai, 1825, T. VIII, p. 539, relates that a Captain of the 115th of the line received, in October, 1813, on the bank of the Bidassoa, a gunshot wound of the right side, the ball traversing the chest, entering through the shoulder-blade and emerging at the cartilage of the fourth rib near the sternum. He expectorated, twelve days afterwards, a piece of blue cloth and a small sequestrum. A year subsequently, he expectorated a larger sequestrum, and then recovered his health completely and resumed his military duties. He afterwards married and begot two children. In 1825, he enjoyed good health. Baron PERCY (*l. c.* p. 125) tells of his friend M. the Marquis of Bavilly, who enjoyed good health, though shot in the chest ten years before, and having expectorated many patches, and even pieces of tow used as wadding. Professor GROSS (*Practical Treatise on Foreign Bodies in the Air-passages*, 1854, p. 58) recalls the instance recorded by FABRICIUS HILDANUS (*op. om.* p. 41, 1682, already cited in note to p. 591), that of TULPIUS (*Observat. Medic.* Lib. II, obs. 15, Amsterdam, 1652), and that of Pigray (*Épitome des Préceptes de médecine et chirurgie*, Rouen, 1642), of necrosed fragments of bone and pieces of tents coughed up three, four, and six months after injury. In his *System*, 5th ed., Vol. II, p. 406, Professor GROSS cites other cases, and among them, two "of the spontaneous expulsion of bullets in the act of coughing." Dr. F. H. Hamilton (*Prin. and Pract. of Surg.*, 1872, *p.* 112), misleads his readers by referring for the above case to the *New York Medical Record*, Jan. 15, 1867, which contains no allusion to it.

and returned to duty March 21st, 1865," signed by Surgeon C. McDermont, U. S. V. This is all the evidence presented by the official files of the Surgeon General's Office; but, in his second application, filed at the Pension Bureau, Miltenberger adds the following testimony: "Wallace K. Hughes, M. D., Berlin Centre, Mahoning County, Ohio, under oath, declares that he was the surgeon of the 12th Ohio Cavalry, and that he treated Miltenberger while in the service aforesaid. He attended Miltenberger during the time between June 9th, 1864, and June 11th, 1864, and March, 1865, to November, 1865. At the battle of Mount Sterling, Kentucky, June 9th, 1864, at about nine o'clock A. M., Miltenberger was wounded by a minié ball in the left lung, the ball lodging. He was sent to hospitals and did not again return until in March, 1865, and I treated him from March, 1865, to muster-out of regiment, November 14th, 1865, for said wound. Ball remained in his lung up to date of his discharge and had produced phthisis pulmonalis." The official army register of the Volunteer force of the United States Army, published by the Adjutant General, Washington, August 31st, 1865, states, Part V, p. 19, that Surgeon G. W. Brooks, 12th Ohio Cavalry, resigned August 7th, 1865, and that Assistant Surgeon Wallace K. Hughes, 12th Ohio Volunteers, was promoted Surgeon, September 20th, 1865. The affidavit of Dr. Hughes is not in accord with the certificates of Drs. Brooks, Peters, and McDermont, or the report of Dr. Geiger. The applicant informed Dr. Geiger that he was wounded at Saltville, Virginia, April 7th, 1864, and Dr. Hughes states that this particular wound was received at Mount Sterling, June 9th, 1864. The applicant alleges that he expectorated the ball in February, 1866; he told Dr. Geiger that it was ejected on March 26th, 1867. Erastus Moderwell, late Major 12th Ohio Cavalry, testifies to knowing Miltenberger intimately, and to the wound of the lung as above stated, and that the soldier was under his immediate command. Major Moderwell was, himself, pensioned for a very curious injury. He was reported by his regimental surgeon, Dr. George W. Brooks, as having received "a severe gunshot fleshwound of the abdomen, at Mount Sterling, Kentucky, June 9th, 1864." His name does not appear on the registers of any general hospital. He was furloughed for eight months, and then served with his regiment till its muster-out in November, 1865. In his application for pension, Dr. W. K. Hughes certifies that "the ball entered on a line with, and five inches to the left of, the umbilicus and passed directly through, coming out near the spine." Examining Surgeon W. C. Brown, of Geneseo, Illinois, reports, July 25th, 1866, "that the ball entered parallel to the umbilicus four or five inches to the left and made its exit near the spine on the same side. The result of this injury is partial paralysis of the left leg." The same surgeon reports, November 21st, 1871, that "a small portion of the transverse process of spine was taken away by the ball." Examining Surgeon S. C. Plummer, Rock Island, January 1st, 1872, reports that the "ball entered two and a half inches above and one inch in front of anterior superior process of left ilium, ranging backward and upward, nipping the transverse process of the third lumbar vertebra and escaped about one inch to the left of the spinous process. The left leg is partially paralyzed, and, in changeable and damp weather, becomes so painful *as to require the use of opiates.*" This pensioner was last paid, March 4th, 1872; his pension increased to the maximum (or $25 per month) from November 7th, 1871. The *Pittsburg Evening Chronicle* publishes this as an interesting case of wound penetrating the abdomen, and announces that the ball carried in with it a gold pen, which afterward worked its way out at the neck!

The next abstract was read at a meeting of the Association of Army and Navy Surgeons, at Richmond, at the conclusion of a valuable report on *Gunshot Wounds of the Chest*, by Surgeon W. G. Thom, P. A. C. S. The particulars were communicated to the reporter by Surgeons W. Selden and W. J. Moore, P. A. C. S. The case was printed in the *Confederate States Medical and Surgical Journal* for April, 1864:*

CASE.—"Mr. R. D. Q., 22 years old, of scrofulous temperament, in January, 1840, was leaning on his gun, the muzzle in contact with his left side, when it exploded, tearing a hole in the chest of three or four inches in diameter, carrying with the load of shot fragments of the third, fourth, and fifth ribs, and the whole of a very large, heavy English gold patent-lever watch, except the ring to which the chain was attached, which, singular to say, was found in the lining of his waistcoat on the right side. Dr. Selden found the patient apparently about to expire, and, from the impending suffocation upon the ingress of air within so large an opening, he could make no exploration of the wound. Closing the wound with a large compress and bandage, opium and stimulants were freely administered. Reaction took place, and, in a fortnight, sufficient adhesions were established to permit exposure of the cavity of the wound and to recognize and remove the metal face of the watch from some six inches at the bottom of the wound. For several weeks fragments of the watch continued to present themselves and were extracted, some from upon the diaphragm, others below the clavicle. The lung collapsing, was not torn to pieces, though wounded in several points. Both the heart, covered by the pericardium, and the aorta were exposed to view and to touch. Suppuration was enormous; hæmorrhages frequent. The collapsed lung became bound down by adhesions. The whole side of the thorax sank. Sustained by every article of nutritious food calculated to supply an inordinate appetite, the patient's recovery was slow, until the wound, progressively reduced, could only admit a female catheter. The supervention of the *tintement métallique* during the progress of the case offered the enviable opportunity of viewing the cause of its production. Drs. Andrews and Higgins (whose patient Mr. D. was), were perfectly assured that the bursting of the bubble on the surface of the pus was the rationale of the sound. Fragments of watch and bone together, with shot and other extraneous matters, continued for some time to be

* The original histories of the cases of transfixion of the chest by a *gig-shaft*, with recovery of thirteen years' duration, and by an iron-pointed try-sail yard, in the person of a sailor, who survived many years, are preserved, with the instruments of penetration, in the Hunterian Museum (see Dr. Earle's account, *Am. Jour. Med. Sci.* N. S., Vol. II, p. 117). Mr. South gives a good account of them in his *Notes to Chelius*. Dr. HOPSTON, of Wheeling (*Am. Jour. Med. Sci.* N. S., Vol. IX, p. 342), records a case in which a piece of coarse linen, two inches and a half in length by two in width when unrolled, the patch of a ball that had perforated the lower lobe of the right lung twenty-five years previously, was found, after death, in a cavity opposite the fifth intercostal space. The cavity was lined with a tough membrane, and communicated with several bronchial tubes. The specimen was presented to the Wistar Museum. Surgeon J. J. B. Wright's account of the case of General Shields, whose right chest was perforated by a canister shot at Cerro Gordo, April 18, 1847, may serve the junior medical officers as a model clinical history. It is printed in Dr. F. H. Hamilton's *Practical Treatise on Military Surgery*, New York, 1861, p. 157.

ejected by expectoration with sputa. Mr. D. possesses, now, every part of the watch except the hands, a considerable portion of the *small works* having been expectorated. The openings into the lung were of sufficient size to allow a current of air to escape, and, if directed against the flame of a candle to extinguish it. Mr. D's health continues feeble, but is as robust as it had been during the past five years."

The surgeon will not forget that it is possible that the ball supposed to have lodged in the chest may have pouched the clothing and been withdrawn when the patient was undressed,* and on the other hand that two opposite wounds do not necessarily imply perforation by a ball, but may indicate the lodgement of two balls. Of balls passing from the chest into the abdomen, and voided at stool, some remarkable examples have been adduced. Of those encysted in the lung substance, and the local alterations to which they give rise, and of those producing abscesses and thoracic fistulæ, I shall have something to add farther on. They are less dangerous than those that lie free in the cavity, rolling on the diaphragm. Such, Baudens would have us search for with a sound, armed with a sharp stylet, to be thrust through the intercostal space from within outward, as a guide for incision, when the seat of the foreign body is detected. I concur with M. Legouest that it is better to make the incision without this dangerous auxiliary. I think that the experience I have endeavored to sum up fully warrants the employment, with due discretion, of persevering efforts to detect and extract foreign bodies from the chest in the very limited number of cases in which there is a probability that the search can be successfully prosecuted without jeopardy to life,—which, perhaps, is but a restatement of the proposition in different terms. I have ventured to include with the operations the all-important subject of the treatment of wounded arteries in the clavicular region, an innovation which I trust my colleagues will approve.†

The section may be concluded with the following summary of operations on the chest:

Table XXIII.

Numerical Statement of Four Hundred and Ninety-four Operations in Cases of Injuries or Diseases of the Chest.

OPERATION.	Cases.	Died.	Discharged.	Duty.	Result Unknown.
Ligation of the Subclavian	25	20	5	.....	.....
Ligation of the Internal Mammary	2	2	.....	.....	.....
Ligation of the Suprascapular	1	.....	1	.....	.....
Ligation of the Intercostal	8	6	2	.....	.....
Ligation of the Axillary	13	13	.....	.....	.....
Ligation of Branches of the Axillary	2	1	.....	1	.....
Excision of portions of the Clavicle	11	7	4	.....	.....
Excisions of portions of the Scapula	4	1	2	1	.....
Excisions of portions of the Ribs	4	1	3	.....	.....
Removal of portions of Sternum, Ribs, etc	84	24	42	18	.....
Thoracentesis	24	15	7	2	.....
Extraction of Balls and other Foreign Bodies	316	108	119	81	8
Aggregate	494	198	185	103	8

* Else he may be subjected to the mortification experienced by the surgeon mentioned by Dr. Fraser, into whose charge fell an officer who bore his rough pokings patiently for a considerable time, and then inquired, "What are you doing?" and met the reply, "Searching for the ball," with the ejaculation, "I wish you had said so earlier, because you will find it in my waistcoat pocket." It is remarkable that identically the same incident occurred to Bordenave in the case of the Marquis de Besons (see BAGIEU, *Examen de Plusieurs Parties de la Chirurgie*, Paris, 1756, p. 25).

† Since the achievements of Dr. Billroth and others in the recent Franco-German war, I am led to regard the management of wounds liable to involve the great vessels at the upper part of the chest as perhaps the most important field of study for those who occupy themselves with questions of what the French term *la haute chirurgie*.

WOUNDS AND INJURIES OF THE CHEST.

Mortality, Complications, Diagnosis, Treatment.

In the preceding sections of this Chapter some particulars have been presented of five hundred cases of wounds of the chest, and more general reference has been made to an aggregate of over twenty thousand such injuries, distributed as follows:

Table XXIV.

Numerical Statement of Twenty Thousand Six Hundred and Seven Cases of Wounds and Injuries of the Chest reported during the War.

CHARACTER OF WOUND.	Cases.	Died.	Discharged.	Duty.	Undetermined.	Ratio of Mortality.
Sabre Wounds	9	1	4	4	.....	11.1
Bayonet Wounds	29	9	6	12	2	33.3
Incised Wounds	27	8	5	14	.....	29.6
Punctured Wounds	6	4	1	1	.....	66.6
Contusions	225	5	15	205	.....	2.2
Simple and Compound Fractures of Ribs, not gunshot	47	4	9	25	9	10.5
Gunshot Flesh Wounds	11,549	113	1,790	8,988	658	1.0
Gunshot Penetrating Wounds	8,715	5,260	1,939	1,204	312	62.5
Totals	20,607	5,404	3,769	10,453	981	27.5

It might be supposed that, with so large a body of facts determined with reasonable accuracy, and the total number of wounded being known approximatively, it would be easy to compute the relative frequency of wounds of the chest and of those received in other regions of the body. But it must be considered, that the complete statistics of the battle-field are never ascertained. In engagements of magnitude, the number of killed in action is rarely determined with precision, for both victors and vanquished report many "missing," whose fate is unknown. The exact information we possess of the character of the wounds of those known to have been killed, is comparatively small. Doubtless, a large proportion, perhaps the largest proportion, of speedily mortal wounds, are attended by lesions of the lungs or great vessels. The men fall and die, more or less rapidly, from syncope or asphyxia; but all precise knowledge of the nature of their injuries is lost.

If it is attempted to frame estimates from the number of wounded coming under treatment only, other difficulties arise. Several wounds in the same individual are common, and the same ball traverses frequently several organs or regions. Therefore, approximations only are attainable. The figures in Table XXIV are taken from lists including the names and descriptions of injuries of two hundred and fifty-three thousand one hundred and forty-two (253,142) wounded men.* Hence, it may be roughly stated that the proportion of wounds of the chest to the whole number received in field or siege operations was about one in twelve.

* When the lists have been exhaustively compared and verified, it is estimated that this aggregate will be augmented to about two hundred and seventy thousand (270,000) cases of wounded men reported by name.

For the last year of the War, nearly complete numerical returns of all the wounded in action, in the Union Army, exclusive of those killed in battle, are available. In the following statement (TABLE XXV) is set forth the relative proportion of wounds of the thoracic walls and cavity to the total number of wounds, excluding only a few reports in which the flesh and penetrating wounds were not distinguished. The Confederate wounded that came under our care, are not included in this return. It will be seen that the mean proportion of all chest wounds (7,173) to the aggregate of wounds of all regions (105,540) is a little less than one in fifteen. The highest ratio is for the open field fighting of the Army of the Shenandoah (9.38 per cent, or about one in ten); the lowest for the force besieging Mobile by regular approaches (3.83 per cent., or one in twenty-six nearly). The ratio is explained by the unusual predominance of the proportion of head injuries among these entrenched troops.

TABLE XXV.

Partial Numerical Statement of Gunshot Wounds of the Chest in the Field or Primary Hospitals in various Campaigns during the last year of the Rebellion, 1864–65.

BATTLES, ACTION, OR SERIES OF ENGAGEMENTS.	WOUNDS OF THORACIC PARIETES.		PENTRATING WOUNDS OF CHEST.		MISSILE.		TOTAL WOUNDED.	PERCENTAGE OF CHEST WOUNDS.
Names or Dates.	Cases.	Deaths.	Cases.	Deaths.	Large projectiles, cannon shot, shell, and bomb fragments, grape, and canister.	Small projectiles, musket, carbine, rifle, pistol balls, and small missiles from shrapnel and canister.		
*Army of the Potomac from May 4th to August 31st, 1864	1,613	6	1,025	366	220	2,392	38,944	6.77
Armies of the Cumberland, Tennessee, and Ohio during the Campaign to Atlanta from May 4th to September 8th, 1864	818	28	968	408	100	1,618	23,308	7.66
Armies of the Cumberland, Tennessee, and Ohio, and Cavalry, General Hood's invasion of Tennessee, from October 25th to December 31st, 1864	132	2	86	16	19	195	3,610	6.03
General Sherman's Campaign in 1865 through the Carolinas	56	1	52	22	1	105	1,533	7.04
Armies of the James and Ohio, etc., from Fort Fisher to Goldsboro', N. C., 1865	43	1	53	13	21	70	1,075	8.93
Army of the West Mississippi during the siege of Mobile, from March 26th to April 9th, 1865	43	.....	38	3	14	61	2,111	3.83
Army of the James during General Grant's Campaign against Petersburg from May 4th, 1864, to April 9th, 1865	475	5	460	107	86	808	16,120	5.80
Engagements in the Shenandoah Valley, May 4th to August 20th, 1864	126	3	80	22	16	189	2,196	9.38
Campaign in the Shenandoah Valley, Aug. 21st to Dec. 30th, 1864	303	.....	193	38	38	451	7,542	6.57
*Army of the Potomac from Sept. 1st, 1864, to April 9th, 1865	361		248	75	30	530	9,101	6.69
Aggregate	3,970	54	3,203	1,070	545	6,419	105,540	6.79

M. Scrive, from extensive data,† derived from the French returns from the pitched battles in the Crimea and from the trenches before Sevastopol, estimates the relative frequency of chest wounds in the total of wounded as one in twelve in siege operations, and one in twenty in open field fighting.

* Incomplete.

† SCRIVE, *Relation Médico-chirurgicale de la Campagne d'Orient*, Paris, 1857, p. 443. The author gives the relative frequency of wounds, according to their seat in the principal divisions of the body as, in sieges: For the head, 1 in 3.4; the neck, 1 in 46; for the chest, 1 in 12; for the abdomen, 1 in 15; the upper extremities, 1 in 6.2; the lower extremities, 1 in 4.3. In open field actions: For the head, 1 in 10; the neck, 1 in 112; the chest, 1 in 20; the abdomen, 1 in 40; the upper extremities, 1 in 4.3; the lower extremities, 1 in 3.5.

In the British Army in the Crimea, the proportion of chest wounds to the aggregate in which the seat of injury was determined was as one in sixteen.[1]

M. Chenu gives the relative frequency of chest wounds to the total number of wounded in the French Army in the Crimea[2] as one in twelve and one-sixth, and in the Italian war of 1859,[3] as one in thirteen and eight-tenths.

Dr. Stromeyer[4] gives the proportion of chest wounds in thirteen hundred and ninety-four hospital cases of wounded under his care at Langensalza, as one in twelve and six-tenths. After the battle of Idstedt,[5] in the Danish War of 1855, he treated twelve hundred and ten cases, and the proportion of chest wounds was nearly one in twelve.

Demme[6] tabulated the wounds of eight thousand five hundred Austrians, and of eight thousand five hundred and ninety-five French and Piedmontese, in the hospitals at Pavia and Brescia and Milan, in 1859, and made the proportion of chest wounds to the aggregate one in twelve and a half for the former, about one in fourteen in the latter.

Professor H. Maas,[7] of Breslau, had under his charge in the Silesian campaign of the Six-Weeks War, two hundred and twelve wounded, of whom eighteen, or one in twelve, had chest wounds. Professor H. Fischer[8] treated, at the siege of Metz, eight hundred and seventy-five wounded, the proportion of chest wounds being about one in twelve.

Dr. Bernhard Beck[9] reports, after the action at Tauberbischofsheim, fifty-seven wounded, with a proportion of chest wounds of about one in ten. The same distinguished surgeon[10] reports the cases of four thousand three hundred and forty-four wounded in the engagements about Strasburg, in 1870, of which one-twelfth were chest wounds. Dr. Serrier[11] long since collected, from observations by H. Larrey, Jobert, Dupuytren, and Baudens, the statistics of seven hundred and eighty-four cases of gunshot wounds, of which fifty-three, or nearly one in fifteen, were in the chest. But it is needless to recapitulate statistics so often copied.

After Sedan, six hundred and ten wounded were treated at the Anglo-American ambulance at the château of Asfeld, on the battle-field, about one-twelfth having received chest wounds. Mr. MacCormac[12] has carefully classified these injuries.

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1 The total number of British officers wounded during the Crimean War was 579, of which number 54, or about 1 in 10, received chest wounds. During the period from the debarkment till the end of March, 1855, there were reported among non-commissioned officers and men 4,434 wounded; but in 1,815 of these the seat of injury was undetermined. Of the remaining 2,619 cases of wounds, 153 were of the chest. During the second period, from April 1, 1855, to the end of the War, the wounded non-commissioned officers and men reported numbered 7,153, from which 72 cases remaining under treatment and enumerated in the first category should be deducted, leaving 7,081 determined cases, of which 420 were chest wounds. Hence, $579 + 2{,}619 + 7{,}081 = 10{,}279$, or the aggregate of determined cases of wounds, and $54 + 153 + 420 = 627$, the total of chest wounds, and $10{,}279 \div 627 = 16.3$, the proportion of chest wounds to the aggregate.

2 M. CHENU (*op. cit.*, pp. 627, 636) gives the total killed and wounded of the French Army in the Crimea as 50,826. Deducting 10,240 killed, there remain 40,586 wounded. In 34,306, the seat of injury was reported, and 2,818 were returned as wounds of the chest, or 1 in 12 1-6.

3 In the Italian War of 1859, M. Chenu (*op. cit.*, T. II, pp. 474, 851) states the French losses from the enemy's fire at 17,054, including 2,536 killed outright. Of the remaining 14,518 wounded, 1,052 received wounds of the chest, or 1 in 13.8.

4 STROMEYER, L. *Erfahrungen über Schusswunden im Jahre* 1866, Hannover, 1867, S. 18. Of 1,394 cases of gunshot wounds 110, or 1 in 12.6, were of the chest.

5 DERSELBE. *Maximen der Kriegsheilkunst*, Hannover, 1855, S. 585. "Of 1,210 wounded near Idstedt, 97 had injuries of the thorax," or 1 in 12.4.

6 DEMME. *Militär-chirurgische Studien*, Würzburg, 1861, Erste Abth., S. 19. Of 8,500 wounded Austrians, 680 were struck in the chest, or 1 in 12.5; of 8,595 French and Sardinian wounded, 595 had chest wounds, or 1 in 14.4.

7 MAAS, H. *Kriegschirurgische Beiträge*, Breslau, 1870, S. 72. At the hospital at Naehod, in central Silesia, Professor Maas treated 212 wounded Prussians, among whom, 18, or 1 in 11.7, had been struck in the chest.

8 FISCHER, H. *Kriegschirurgische Erfahrungen*, Erlangen, 1872, Theil I., S. 28. At the hospitals of Forbach, Styringen, Neuenkirchen, and Ottweiler, under Professor Fischer's charge, of a total of 875 cases of wounds, 76, or 1 in 11.5, were of the chest.

9 BECK, B. *Kriegschirurgische Erfahrungen*, Freiburg i. B. 1867, p. 26. Of 57 cases, the chest was injured in 6, or 1 in 9.5.

10 DERSELBE. *Chirurgie der Schussverletzungen*, Freiburg, i. B., 1772, Erste Hälfte, S. 160. Dr. Beek was generalarzt of the fourteenth German corps, the Bavarian army corps of General Werder, in the late Franco-German war. He reports an aggregate of 4,344 wounded, of which 361 had chest wounds, or 1 in 12.03.

11 SERRIER. *Traité de la Nature, des Complications, et du Traitement des Plaies d'Armes à Feu*, Paris, 1844, p. 30.

12 MACCORMAC, W. *Notes and Recollections of an Ambulance Surgeon, being an Account of Work done under the Red Cross during the Campaign of* 1870, London, 1871, p. 127. M. Duplessis, chief physician of the military hospitals at Sedan, placed, on August 31, 1870, the day before the great battle, the barracks at Asfeld, a hospital of 384 beds, in charge of the 16 surgeons of the Anglo-American Ambulance. Mr. MacCormac reports that they received 610 wounded, of whom 54 had received wounds of the chest, or 1 in 11.29.

Thus a comparison of the returns of the War of the Rebellion with those from the Crimea,* the Danish, Italian, Bohemian, and Franco-German wars, presents a remarkable uniformity in the comparative frequency of wounds according to their seat.

Of information regarding the seat of injury in those killed in battle, we possess but little, and that little is, for the most part, in the shape of general observations, insusceptible of reduction to numerical estimates. Dr. Fraser remarks that "if it were not for the financial objection, a special staff of medical men might well be employed during circumstances similar to that in which the army was placed before Sebastopol, or in any standing camp before an enemy, to ascertain the kinds of wounds which kill on the field." The humane objection comes in also; for, in large conflicts, the medical staff is invariably insufficient numerically, and all auxiliaries are brought into requisition. Yet, in our lines before Petersburg, a zealous and indefatigable surgeon, to whose contributions to field surgery I have such frequent occasion to advert, found time to examine nearly all of the dead bodies left on the field after a brisk and deadly assault. This observation of Surgeon

*I take the liberty of quoting entire Dr. Fraser's tables of the chest wounds in the British army in the Crimea, and of the relative frequency and mortality of this class of injuries in other campaigns. The information contained in TABLE V has been cited by many authors, with scanty acknowledgment, and usually with slight, but not advantageous, alterations. I agree with Dr. Fraser and Dr. Neudörfer (*Handbuch der Kriegschirurgie*, Leipzig, 1867, S. 553) that the 153 chest wounds of the first period in the Crimean war should be added to the summary, and have, accordingly, added them in the statement in the text.

"TABLE IV.

STATISTICS OF WOUNDS OF THE CHEST.

Total Number of all Wounds, 12,094, in the Crimean War.

WOUNDS.	Cases.	Per Cent.
TO TOTAL NUMBER WOUNDED.		
Percentage of all chest wounds to total number wounded.	474*	3.90
Percentage of actual lung wound to total number wounded.	164	1.35
Mortality of all chest wounds to total number wounded.	135	1.11
Mortality of actual lung wound to total number wounded.	130	1.07
TO TOTAL STRENGTH.		
Percentage of all chest wounds	474	0.54
Percentage of actual lung wounds	164	0.17
Mortality of all chest wounds	135	0.14
Mortality of actual lung wound	130	0.13

	Cases.	Deaths.	Per Cent.
Mortality of all chest wounds	474	135	28.50
Mortality of actual lung wound	164	130	79.26

* To this number ought properly to be added 153, being the number of chest wounds received during the first period of the war, of which 32 are reported to have died, making a grand total of 627; but, as the data for the first period of the war is uncertain, the number has not been admitted into the calculation.

TABLE V.

Showing the Number of Chest Wounds on the occasions named, and from the Authorities quoted, with the Percentage of Deaths to Wounded.

ACTIONS, ETC.	Wound.	Died.	Per Cent.
The Director-General's Records prior to Crimean War.	39	27	70.00
Crimea	474	135	28.50
Sympheropol (Russians)	200	197	98.05
Toulouse	106	50	50.00
Quebec	26	2	7.07
Carlist War	29	27	100.00
Paris, 1830	20*	10	50.00
Paris, 1848	9	4	44.00
Paris, 1850	11	5	45.50
Battle of Kilet	21	11	50.00
Battle of Idstedt	97	17	17.00
Battle of Canton	4	4	100.00
M. Menière	20	20	100.00
M. Legouest	6	3	50.00
Guy's Hospital Reports	72†	9	12.50
Danish War; Report of Chief-Surgeon Schytz. Total wounded, 227.	10	2	20.00
Dr. Kidd	36	24	66.00
Aggregate	1,180	547	

* De Lamballe and Baudens.

† Of this number, the lung was really wounded in two cases only."

J. A. Lidell, U. S. V., has already been recorded.[1] On the morning of March 25th, 1865, he examined forty-three bodies of soldiers killed in the combat near Fort Steadman, in the lines before Petersburg; twenty-three were shot in the head, fifteen in the chest, and five in the abdomen. "The bodies of all those wounded in the abdomen were very much blanched, as if they had died of hæmorrhage, and the same remark held true in regard to all but two or three of those wounded in the chest." On the evening of March 14th, 1862, I examined the bodies of nearly all of those killed before New Berne, and ascertained the seat of injury, and in subsequent engagements of the Ninth and Eighteenth Corps, in North Carolina, I augmented this list to an aggregate of seventy-six observations of the bodies of those slain on the field. The mortal wound was in the head in twenty-seven; in the neck in four, including two in which the ball lodged in the cervical spine; in the chest in thirty-two, the heart or great vessels being perforated in eight, at least; in the abdomen in nine; in the extremities in four. In one of the last division, the femoral artery was cut nearly across; in another the thigh was torn completely away by cannon shot; and in the two others, there was frightful comminuted fracture of the upper part of the femur from large projectiles.

In the carefully compiled statistics of the New Zealand War of 1863–5,[2] the chest wounds in a total of wounded of four hundred and sixty-three, numbered again about one in twelve; and in one hundred and eighteen cases, in which the region of the body wounded, in men killed outright on the battle-field, was accurately ascertained, the mortal wound was found in the head in forty, the neck in four, the chest in fifty-nine, the abdomen in eleven, the thigh in four; the chest wounds equalling in numbers all the others.

General-Arzt F. Loeffler reports[3] the seat of injury in three hundred and eighty-seven Prussians killed in the Danish War of 1864. The chest wounds numbered one hundred and seventeen, or about one-third.

That of those killed in battle, from one-third to one-half, and of those wounded in action, one-twelfth, receive wounds of the chest, may be accepted as very near the truth.

[1] *Surgical Report* in CIRCULAR No. 6, S.G.O., 1865, p. 29, and LIDELL, *On the Wounds of Blood-vessels*, etc., already cited, New York, 1870, p. 12.

[2] MOUAT, J., *Special Report on Wounds and Injuries received in Battle in the New Zealand War* of 1863-4-5. Extracted from the Medical and Surgical History of the New Zealand War, London, 1867, in Volume VII of the *Statistical, Sanitary, and Medical Reports* of the Army Medical Department, presented by Director-General T. G. Logan. Of 463 wounded, 38, or 8.2 per cent., received wounds of the chest, or about 1 in 12.

[3] I venture to quote entire Dr. Loeffler's invaluable table, from his *General-Bericht über den Gesundheitsdienst im* Feldzuge *gegen Dänemark*, 1864, Berlin, 1867, Erster Theil, S. 46:

INJURED REGION.	PRUSSIANS.							DANES.			
	Total killed and wounded.	Killed.	Wounded.	DIED OF WOUNDS.			Total of killed and died.	Total wounded.	FATAL.		
				Died within 48 hours.	Died later.	Total died from wounds.			Died within 24 hours.	Died later.	Total died.
Head	468	196	272	13	12	25	221	120	8	14	22
Neck	48	8	40	3	1	4	12	26	.....	2	2
Chest	254	117	137	20	37	57	174	113	15	61	76
Abdomen and Pelvis	147	44	103	34	25	59	103	89	31	26	57
Spine and Back	99	7	92	3	24	27	34	80	6	26	32
Upper Extremities	610	2	608	2	51	53	55	317	.....	62	62
Lower Extremities	729	13	716	7	83	90	103	458	6	140	146
Aggregate	2355	387	1968	82	233	315	702	1203	66	331	397

Mortality of Wounds of the Chest.—Great diversity of opinion has existed and still exists as to the comparative fatality of chest wounds. With the data now available an approximate solution of this problem should be attainable, and I propose to offer facts that must, if not controverted, determine the question, from the statistical point of view.

If we assume the relation of chest wounds to the aggregate of wounds to be about one in twelve, or 8.3 per cent., we find, in the first place, that the mortality of chest wounds greatly exceeds the average. Dr. E. Klebs[1] made autopsies in the cases of all those who died in the military hospitals at Carlsruhe, in August and September, 1870, from the consequences of wounds and operations. Of one hundred and twenty-nine autopsies, twenty were in deaths from wounds of the chest, or 15.5 per cent.

On the other hand, the proportion of recorded survivors after chest wounds is much less than the average. The United States Commissioner of Pensions[2] reports seventy-six thousand four hundred and sixty-nine pensioners on the rolls on account of injuries of all sorts, of which three thousand seven hundred and thirty, or one in twenty, or 4.8 per cent., are pensioned for the results of injuries of the chest.

Professor Adolph Hannover,[3] of Copenhagen, informs us that the number of Danes pensioned for wounds, after the war of 1864, was fifteen hundred and eighty-eight, of whom only fifty-nine, or 3.7 per cent., had received wounds of the chest.

Dr. George Williamson[4] states that of the six hundred and three wounded soldiers that arrived in England after the India Mutiny, only nineteen, or 3.15 per cent., had received chest wounds.

Regarding the mortality of penetrating wounds of the chest in recent wars, I have been enabled to collect the following information:

In the New Zealand War,[5] the fatality of gunshot wounds of the lung was 60.8 per cent.

In the French army in the Crimea, the fatality of gunshot wounds of the chest known to have been penetrating was 91.6.[6] In the British Army in the Crimea,[7] the mortality of six hundred and twenty-seven chest wounds was 26.6 per cent.; of one hundred and sixty-four actual lung wounds, one hundred and thirty, or 79.26 per cent., were fatal.

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[1] KLEBS. *Beiträge zur Pathologischen Anatomie der Schusswunden*, Leipzig, 1872, S. 4. Dr. Klebs observes that the hospitals contained less than the usual proportion of those wounded in the head, chest, and abdomen, the graver cases being left in hospitals nearer the battle-field than Carlsruhe.

[2] BAKER, J. H. *Report of the Commissioner of Pensions to the Secretary of the Interior, for the year ended* June 30, 1871, pp. 6, 20. Hon. J. H. Baker states that the injuries include "all the forms incident to the life of a soldier, but so largely predominant are gunshot wounds that practically they might have been so classed." The chest wounds are separated in the report into external and internal, and 2,507 of the former, 1,223 of the latter constitute the aggregate of 3,730.

[3] HANNOVER. *Die Dänischen Invaliden*, Berlin, 1870, S. 8. The proportion of invalids wounded in the chest is as 1 in 26.

[4] WILLIAMSON. *Military Surgery*, London, 1863, p. 237. Two of the nineteen died shortly after arrival. See Specimens 3637, 3638, and 3669 in the Netley Collection, and Plate II, p. 86, of Dr. Williamson's work. The proportion of those surviving chest wounds temporarily was as 1 in 31.7.

[5] In the New Zealand War, Inspector-General Mouat (*op. cit.*, Vol. vii, p. 485) reports thirty-eight cases of gunshot wounds of the chest. Eleven were wounds of the muscles, one of the bones, three penetrated the chest without entering the lung. Of these fifteen patients, twelve resumed duty and three were invalided. Of twenty-three wounds of the lung, fourteen were fatal, eight patients were invalided, and one returned to duty. The mortality rate for all cases was 36.8 per cent., for the penetrating lung wounds 60.8 per cent. Dr. Mouat's report contains a synopsis of the prominent points connected with the twenty-three cases of wounds penetrating the lung; of seven additional cases of penetrating gunshot wounds of the chest (wounded Maori prisoners), six resulted fatally.

[6] M. CHENU (*op. cit.*, p. 187). From the total of 2,818 classified as chest wounds, are to be abstracted 212 sabre and bayonet wounds and 333 miscellaneous injuries, 538 gunshot contusions with 62 deaths, a mortality of 11.5 per cent., and 576 undetermined gunshot chest wounds with 164 deaths, or 28.4 per cent. There remain 1,159 cases, of which 668, with 87 deaths, were non-penetrating, a mortality of 12.0 per cent., and 491, with 450 deaths, or 91.6 per cent., were penetrating.

[7] MATTHEW (*op. cit.*, Vol. II, p. 313) tabulates only the 474 cases of the second period, with 135 deaths. I have added the 153 cases with 32 deaths of the first period. The mortality of chest wounds in the Russian army in the Crimea has not, as I am aware, been officially reported. Dr. Pirogoff expresses his regret (*Grundzüge der Allgemeinen Kriegschirurgie*, Leipsig, 1864, S. 535) that he cannot furnish any statistical data, and quotes from Demme and Stromeyer. It is stated by Mouat that, at Sympheropol, the Russians had 200 patients with gunshot wounds of the chest, of whom 197 died. The Sardinian army had but few wounded in the Crimea, 193 in all; of whom 10 were killed and 16 died of wounds, according to the table of Dr. Comisetti, president of the Health Board of the Sardinian Army. The effective force of the army was 21,000.

In the Italian War of 1859, Demme[1] reports four hundred and eighty-four superficial, and one hundred and fifty-nine penetrating, gunshot wounds of the chest; forty-three of the former and ninety-seven of the latter died in hospital, or mortality rates of 8.8 per cent., and 61 per cent. In this war, the early mortality, at any rate, from such injuries among the French[2] was much less, amounting to only 46.48 per cent. even for the penetrating gunshot wounds alone.

In the first Schleswig-Holstein war,[3] after the battle of Idstedt, Dr. Stromeyer lost but 17.6 per cent. of patients in the Hannoverian army with gunshot wounds of the chest.

In the Danish War of 1864,[4] the mortality of all gunshot chest wounds was, among the Prussians 41.6 per cent., among the Danish prisoners 67.2 per cent.

In the Six-Weeks War, Dr. Maas[5] reports twelve gunshot wounds of the *lung*, with only four fatal cases, or 33.3 per cent. Dr. Stromeyer,[6] at Langensalza, had but sixteen recoveries in forty-seven penetrating gunshot wounds of the chest, a death rate of 65.9. Dr. Biefel,[7] at the hospital at Landeshut, in Silesia, had forty-four cases of gunshot wounds of the chest, of which fifteen were penetrating. The twenty-nine cases with superficial wounds recovered. Of the remainder, eight, or 53.3 per cent., died.

From the Franco-German War, numerous partial returns have already been received. At Mannheim and Weissenburg, Professor Theodor Billroth[8] lost but nine of thirty patients with penetrating gunshot wounds of the chest.

At Metz, Dr. H. Fischer[9] reports the proportion of fatal gunshot wounds of the chest at 55.8 per cent.

After Sedan, Mr. MacCormac reports[10] the mortality of penetrating gunshot wounds of the chest at the Anglo-American Ambulance at Asfeld, as 54.8. At the field hospital at Floing, Generalstabsarzt Stromeyer[11] had fourteen cases of penetrating chest wounds, seven of whom were likely (September 26th, 1870) to recover.

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[1] DEMME. *Allgemeine Chirurgie der Kriegswunden*, Würzburg, 1864, S. 90. Demme reports in all two hundred and three cases of penetrating gunshot wounds of the chest; but states that forty-four were without injury of the viscera. He gives his farther statistics from the one hundred and fifty-nine remaining cases and drops the forty-four cases. This is one of the many careless errors in Demme's statistics, of which Dr. Lœffler justly complains. They abound in the second edition, of 1863, for which reason, I quote usually from the edition of 1861.

[2] M. CHENU (*op. cit.* T. II, p. 474) tabulates one thousand fifty-two chest wounds; deducting thirty-seven sabre, bayonet, and lance wounds, and two hundred and four miscellaneous injuries, there remain eight hundred and eleven gunshot wounds distributed as follows: contusions forty-eight, with seven deaths; fractures one hundred and twenty-eight, with twenty deaths; contused wounds three hundred and seventy-nine, with four deaths; penetrating wounds two hundred and fifty-six, with one hundred and nineteen deaths, or 46.48 per cent.

[3] July 20th, 1850. Dr. Stromeyer had seventeen deaths in ninety-seven patients with chest wounds, in a total of twelve hundred and ten wounded. *Maximen der Kriegschirurgie, S.* 385.

[4] LŒFFLER (*loc. cit.*) From the table quoted, compiled with a precision unattainable except in a population where every individual is registered, it appears that of twenty-three hundred and fifty-five killed and wounded Prussians, two hundred and fifty-four, or one in 9.27, received wounds of the chest. One hundred and seventeen of the two hundred and fifty-four fell dead; of the one hundred thirty-seven remaining wounded, fifty-seven died in hospital (twenty within forty-eight hours), or 41.6 per cent. Among twelve hundred and three wounded Danish prisoners, one hundred and thirteen, or one in 10.6, had chest wounds, of which seventy-six, or 67.2 per cent., proved fatal. Dr. Lœffler gives us the assurance, which, in his case, is unnecessary, that the larger mortality among the prisoners was not due to any difference in the treatment received by the prisoners. Professor Billroth justly extols the statistics of Dr. Lœffler, as examples of the exactitude possible in large consolidated surgical statements. I regret that I cannot refer to the second part of Dr. Lœffler's work which doubtless, separates the penetrating from the non-penetrating chest wounds, and gives the ulterior mortality.

[5] MAAS. *Kriegschirurgische Beiträge*, S. 72. [6] STROMEYER. *Erfahrungen über Schusswunden*, S. 42.

[7] BIEFEL. *Im Reserve Lazareth. Kriegschirurgische Aphorismen*, von 1866, in Langenbeck's Archiv für Klinische chirurgie, B. XI, S. 369.

[8] BILLROTH (*Chirurgische Briefe aus den Kriegs-Lazarethen in Weissenburg und Mannheim*, 1870, Berlin, 1872, S. 192) reports that of thirty cases of penetrating wounds of the chest, nine, or 30 per cent., died, a result so much more favorable, as several of the fatal cases (cases 3, 12, and 26) might be excluded on account of severe complications with other injuries, and as one of the wounded, a convalescent, fifty-seven days after the injury, was attacked by typhus and died in consequence.

[9] FISCHER, H. (*Kriegschirurgische Erfahrungen*, Erster Theil, vor Metz, *Erlangen*, 1872, S. 116) says: "Seventy-eight gunshot wounds of the thorax were treated, and of these, thirty-four, or 43.5 per cent., were perforating. * * Of the seventy-eight cases of gunshot wounds of the thorax, nineteen died, or 24.3 per cent. The fatal cases were all in consequence of perforating wounds, of which latter class therefore 55.8 per cent. died." Dr. Fischer adds: "Really remarkable is the fact that Billroth lost only five of thirty cases of this kind, or 16.6 per cent., as his mode of treatment varied little from that usually employed." If Dr. Fischer deducts the three cases of amputation and one of typhus from the mortality, he should deduct them also from the aggregate, which would leave twenty-six cases with five fatal, or 19.2 per cent. But it will hardly be claimed that this constituted the entire ultimate proportion of mortality.

[10] MACCORMAC (*op. cit.*, p. 126). Of fifty-four wounds of the chest treated, thirty-one were regarded as penetrating, of which seventeen terminated fatally.

[11] IBID., p. 122. There were at this Feld-Lazareth one hundred and twenty-one patients—sixty-four Germans, fifty-seven French.

Regarding the mortality of wounds of the chest in the War of the Rebellion, we have the data afforded by TABLE XXV, p. 600, giving the gunshot wounds of the chest for nearly all of the Union soldiers during the last year of the war. Of three thousand nine hundred and seventy patients with superficial wounds, fifty-four died, or 1.3 per cent.; of three thousand two hundred and three with penetrating wounds, one thousand and seventy died, or 33.4 per cent., a total number of chest wounds of seven thousand one hundred and seventy-three, with one thousand one hundred and twenty-four deaths, or 15.6 per cent. But the *Endresultat* does not appear in this computation, and we must have recourse to the aggregate of cases of penetrating wounds of the chest collected from the returns of the general as well as the field and primary hospitals. These results are set forth in the following statement (TABLE XXVI), which includes the cases of Confederate prisoners as well as of Union soldiers:

TABLE XXVI.

Numerical Statement of Eight Thousand Seven Hundred and Fifteen Cases of Penetrating Gunshot Wounds of the Chest reported on the Returns during the War.

CHARACTER OF WOUND.	Cases.	Deaths.	Discharged.	Duty.	Undetermined.	Ratio of Mortality.
Missile entered and passed out, traversing the cavity of the thorax	2,782	1,011	1,352	403	16	36.5
Missile entered the thoracic cavity and was believed to have lodged within it	484	243	189	48	4	50.6
Missile stated to have penetrated the cavity of the chest without specification as to lodgement or exit	1,780	1,348	65	299	68	78.7
Missile entered and wounded lung without specification as to lodgement or exit	1,683	1,192	110	266	115	76.0
Cases described as severe gunshot penetrating wounds of the side, chest, or thorax, without further indication	1,304	1,214	.....	.....	90	100.
Missile impacted between the ribs, but external to the pleural cavity	1	1	.....	.....	.....	100.
Missile fracturing and depressing ribs but not itself entering the thoracic cavity	446	68	176	186	16	15.8
Missile perforating chest and wounding both lungs	58	47	7	2	2	83.9
Missile penetrating and wounding diaphragm	8	8	.....	.....	.....	100.
Missile penetrating both chest and abdomen	121	89	31	.....	1	74.2
With wounds of the intercostal and internal mammary arteries	21	17	4	.....	.....	80.9
With wound of the pericardium	10	6	4	.....	.....	60.0
With wound of the heart	12	11	1	.....	.....	91.6
With wound of the innominata	3	3	.....	.....	.....	100.
With wound of the vena cava	1	1	.....	.....	.....	100.
With wound of the œsophagus	1	1	.....	.....	.....	100.
Aggregate	8,715	5,260	1,939	1,204	312	62.6

One thousand five hundred and sixty-five Confederate cases are included in the statement in TABLE XXIV. Seven hundred and fifty had received non-penetrating, and eight hundred and fifteen penetrating, wounds of the chest. Twelve of the first group died, and four hundred and seventy-eight of the second group. In the second group, two hundred and seventy-one recovered, and sixty-six were returned before convalescence, and their ultimate fate is unknown. The mortality rate for the determined cases of penetrating

gunshot wounds of the chest in Confederate soldiers is therefore 63.8 per cent., or very little more than the mortality of the Union soldiers. These facts are taken mainly from the registers and case-books of Confederate hospitals, or from printed sources of information, or from the registers of Union hospitals in the cases of Confederate prisoners. In the latter group the mortality rate is but slightly above the average, an unexpected result, as the depressing effect of defeat and of confinement among strangers are usually more manifest in the comparisons of mortality, as strikingly shown in the excessive mortality among the Danish prisoners, as pointed out by Dr. Loeffler (*loc. cit.*, p. 56). Of course there is usually a large proportion of the graver injuries among prisoners, and a somewhat larger mortality is to be anticipated.

Abstracting the eight hundred and fifteen Confederate cases, and the two hundred and forty-six undetermined Union cases from the statement of eight thousand seven hundred and fifteen penetrating chest wounds included in TABLE XXVI, there remain seven thousand six hundred and fifty-four determined cases of Union soldiers, with four thousand seven hundred and eighty-two deaths, or 62.4 per cent.

Apart from that furnished by the hospital registers, little statistical material on this subject, as regards the Confederate army, is accessible. The paper by Surgeon Thom, read at Richmond in 1864, would be valuable if correctly printed, and it is to be desired that the author may revise and publish it in full.[1] Surgeon C. Terry[2] reports, from the battle of Chickamauga, six cases of penetrating gunshot wounds of the chest, with four recoveries; and Surgeon D. C. O'Keefe[3] publishes five cases with only one fatal result. Examples of recovery after injuries of this nature are also cited by Surgeons Selden, Thom, Bead, Baruch, Michel, and Browne.[4] All of them are included in my estimates.

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[1] Among the Confederate writers, Dr. E. Warren (*op. cit.*, p. 370) observes that "wounds of the lung are far from being so fatal as might be supposed in advance. Numerous cases have come under my own observation, during the present war, in which rapid recoveries have followed the most severe penetrating wounds of this delicate organ. The experience of Confederate surgeons will confirm the assertion that unless death speedily results from hæmorrhage or collapse, a favorable prognosis may be formed in a majority of such cases." The writer does not indicate the degree of fatality which might be erroneously "supposed in advance," nor describe the numerous recoveries he has witnessed after the most severe lung wounds, and the recorded experience of Confederate surgeons invalidates instead of confirming the assertion that the majority of severe lung wounds get well. Dr. J. J. Chisholm (*op. cit.*, p. 310) says: "Wounds of the chest, when taken as a class, are, perhaps, the most fatal of gunshot wounds. * * Should the lung be severely injured, the case usually terminates fatally." He then relates some remarkable examples of recovery, and adds: "In our experience, penetrating wounds of the chest, even those in which the ball had clearly traversed the lung, are, by no means, so fatal an injury as gunshot wounds of other regions of the trunk." The apparent contradiction is avoided by the limitation of the comparison to wounds of the abdomen, pelvis, and spine. "Under the expectant plan of treatment," Dr. Chisholm continues, "which consists of little more than careful nursing, avoiding all active treatment, more especially bloodletting, we have succeeded in saving a majority of our wounded. Surgeon Thom, in a recent report to the association of army and navy surgeons, gives a list of seventy-four cases of gunshot wounds perforating the chest and transfixing the lungs, as reported by Confederate army surgeons. Of these, twenty died,—a mortality of 25 per cent.,—which indicates clearly the advantages of the expectant course of treatment for this as well as for all gunshot wounds, over the heroic and fatal treatment of former years. As far as could be ascertained, bloodletting had been resorted to in but one case of perforated chest wounds." On referring to the abstract of the report of Surgeon Thom, chairman of the committee on gunshot wounds of the chest, as printed in the *Transactions of the Association of Army and Navy Surgeons*, at page 60, of the April, 1864, number of the *Confederate States Medical and Surgical Journal*, it is found that, after a preliminary dissertation on "the general treatment of injuries of the lungs from missiles, penetrating and cutting weapons; the time and manner of death under such circumstances; the pathological condition, functional embarrassment, or usefulness remaining after these accidents; the mode of production and treatment of emphysema; and the provisions made by nature for accommodating foreign bodies retained within these organs, with the amount of disturbance which ensues," Dr. Thom "regretted that few replies had been received to the interrogatories which the preparation of this report had suggested, and that he could furnish only seventy-four cases of gunshot wounds of the lungs, in which twenty recovered, from which limited number it appeared the mortality was little over twenty-five per cent., or one quarter. As far as could be ascertained, bleeding had been resorted to in but one case, and that recovered." If twenty of the seventy-four cases related by Dr. Thom "recovered," the mortality was 72.9 per cent. and not "a little over 25 per cent." It may be that there is here a clerical or typographical error, and that the writer meant to convey that twenty *died*, as Dr. Chisholm interprets. But the contradiction destroys the statistical value of the report. Were it otherwise, Dr. Chisholm's assumption, that the mortality of 25 (27.2?) per cent., as given in this paper, represented the results of Confederate experience of the danger of gunshot wounds transfixing the lung, would be untenable; and his claim that this startling result was due to the advantages of expectant over depleting treatment is unexpected from a surgeon usually careful and accurate in his statements. I do not yield to Dr. Chisholm in deprecating the employment in chest wounds of the depleting measures of former years, still advocated by Professors Gross and Erichsen and Stromeyer; but to maintain that expectancy or any mode of treatment can reduce the mortality of lung wounds fifty per cent. is to advance a proposition too egregiously improbable to be discussed. One may hope that it was through inadvertence, and not to sustain his argument, that Dr. Chisholm, in quoting Dr. Thom's allusion to the single case of venesection for lung wound, omitted the words "and that recovered." I have had the files of the *Richmond and Louisville Medical Journal*, the *Confederate States Medical Journal*, the *American Practitioner*, the *Nashville Journal of Medicine and Surgery*, the *New Orleans Journal of Medicine*, the *Atlanta Medical and Surgical Journal*, and the *Southern Medical and Surgical Journal*, vainly searched for additional information on this subject.

[2] *Confederate States Medical and Surgical Journal*, Vol. I, p. 75. [3] *Ibid*, p. 25. [4] *Ibid.*, Vol. I.

Three hundred and ninety-five abstracts of gunshot wounds are cited in the preceding pages of this section. It is obvious that they were selected without the slightest reference to the question of mortality, yet they corroborate in a remarkable manner the conclusions of TABLE XXVI. Abstracting eighty-five cases of non-penetrating wounds, with a mortality of 25.8 per cent., there remain three hundred and ten cases of penetrating wounds, with one hundred and ninety-two deaths, a mortality of 61.9 per cent.; or, separating the Union and Confederate cases, there are twenty-seven in the latter and fifteen deaths; two hundred and eighty-three of the former, with one hundred and seventy-seven deaths, a mortality rate of 55.5 and 62.5 per cent., respectively.

I would propose to substitute for the table commonly quoted (TABLE V, cited from Dr. Fraser, p. 602, *ante*) the following, in which such extreme statements as those regarding the battle of Quebec, the street-fighting in Paris, and the losses of the Russians at Sympheropol are excluded:

TABLE XXVII.

Showing the Number of Penetrating Wounds of the Chest on the Occasions named, and from the Authorities quoted, with the Ratio of the Mortality.

ACTION, &c.	Wounds.	Died.	Ratio of Mortality.
New Zealand War (Mouat)	23	15	60.8
French in Crimea (Chenu)	491	450	91.6
British in Crimea (Matthew)	164	130	79.2
French in Italy (Chenu)	256	119	46.48
Austrians and Italians (Demme)	159	97	61.0
Hannoverians in Schleswig-Holstein (Stromeyer)	97	17	17.6
Prussians in Danish War of 1864 (Lœffler)	137	57	41.6
Danes in Danish War of 1864 (Lœffler)	113	76	67.2
Prussians in Six-Weeks War (Maas)	12	4	33.3
Prussians at Langensalza (Stromeyer)	47	31	65.9
Prussians at Landeshut (Biefel)	15	8	53.3
Germans in Franco-Prussian War (Billroth)	30	9	30.0
Germans near Metz (Fischer)	34	19	55.8
French at Sedan (MacCormac)	31	17	54.8
Aggregate	1,609	1,049	65.2

These figures establish that the ordinary percentage of deaths in large series of cases commonly classified as penetrating wounds of the chest[1] is above sixty per cent.; that surgeons erroneously indulge the belief that they save a majority of their patients under these circumstances; and that the more rigorously the diagnoses are scrutinized and the final results traced, the higher the proportion of mortality rises. Dr. Matthew, in his

[1] I share the conviction of NEUDÖRFER (*Handbuch de Kriegschirurgie*, B. I, H. II, S. 554) that the percentage of mortality of actual lung wounds is much higher. In commenting on the British, French, and American statistics on this subject, Neudörfer says: "Diese hier angeführten Mortalitätsziffern sind aber alle viel zu klein; in der Wirklichkeit ist die Sterblichkeitsziffer viel grösser, weil viele von denen, welche als genesen, oder deren Schicksal als unbekannt angeführt ist, nachträglich gestorben sind."

Surgical History of the Crimean War, in the summary on gunshot wounds of the chest (the whole article, as Mr. Blenkins justly observes, being "replete with masterly observations"), remarks that "it seems very doubtful if every case in which the ball was lodged within the pleural chest lining did not terminate in death, and the instances where recoveries are returned (two men and one officer) may be open to great doubt as to whether the ball had actually penetrated." Dr. Fraser believes "that in the human subject, as well as in animals, an actual wound of the substance of the lung is always, sooner or later, mortal, not from the effect of inflammatory action, but, in recent cases, from the sudden cessation of proper aeration in either the whole, or portions of one or two lungs; or sudden hæmorrhage." The opinions of Dr. Macleod, which have had undue weight, in this country, because of the accessibility of his *Notes*, are not to be weighed in comparison with those of Drs. Matthew and Fraser; for his observations on this subject were but few, and those published do not sustain his conclusions, which are conformed to the opinions then in vogue.

The figures that I have given respecting the mortality of penetrating chest wounds conflict with those offered by Assistant Surgeons Smart (p. 510,—150 cases, 49 deaths, or 32.6 per cent.) and Billings (APPENDIX, p. 200,—858 cases at Gettysburg, with 295 deaths, or 34 per cent.) only in appearance. It was impossible for those officers to trace the cases to their terminations. It is seen in TABLE XXV, that I found the mortality, in the *field and primary hospitals*, of all the penetrating wounds of the chest returned in the Union army for the last year of the war, to be 33.4 per cent., or nearly the proportions given by them. I cannot better explain the difference between the early and remote statistical results on this subject, than by referring to the very carefully studied report of Surgeon J. T. Woods, 99th Ohio Volunteers, of fifty-five cases of supposed penetrating wounds of the chest that he observed after the battle of Chickamauga.

The fifty-five patients had all been wounded by conoidal musket balls on September 19th and 20th, 1863, and made prisoners. They were paroled and sent to the Chattanooga hospitals after ten days' detention. Hence, the series includes only those who had escaped the dangers of early hæmorrhages. Dr. Woods made his report early in January, 1864, having had the survivors under his care nearly three months. It was believed that the lung was wounded in all of these cases, and, with few exceptions, they were perforations. Dr. Woods classified them according to their precise seat as follows:

So there were twenty-nine apparent recoveries in a series of cases selected from those who had survived penetrating gunshot wounds of the chest for ten days, or a mortality rate of 47.2 per cent. But, on tracing the twenty-nine survivors to the base hospitals, it is found that one was discovered to have only a non-penetrating fracture of the sternum, and that seven died, several of them within three weeks after leaving Chattanooga. Hence, the table must be amended to fifty-four cases, with thirty-three deaths, or a mortality of 61.6 per cent.

PENETRATING CHEST WOUNDS BY CONOIDAL MUSKET BALL.		Cases.	Deaths.
Right Lung	Upper lobe	6	4
	Middle lobe	5	0
	Lower lobe	3	0
	Not ascertained	5	5
Left Lung	Upper lobe	12	3
	Middle lobe	9	4
	Lower lobe	7	3
	Not ascertained	6	5
Both Lungs	Not stated	2	2
Total		55	26

A false interpretation of some of the statistics generally quoted by systematic authors is one of the causes that have led practitioners to form too low an estimate of the gravity of wounds of the chest, a cursory and partial examination of the figures leading to conclusions very different from those which the author thought to establish. Thus, Guthrie, who fully appreciated the fatality of penetrating gunshot wounds of the chest, cites (*Comm.*, p. 462) one hundred and six such cases after the battle of Toulouse (see Table V, p. 602), remarking that the cavities were not penetrated in all. In seven weeks thirteen had recovered, thirty-five had died, and fifty-seven "were transferred to Bordeaux to proceed to England, some to die and some to be pensioned, but few, in all probability to return to the service, an ultimate loss of nearly one-half, if the cases sent to England could be traced." But they were not traced, and it is a mere assumption to put the percentage of mortality at 50, as even Dr. Fraser has done.[1]

Other causes of the inadequate appreciation of the gravity of wounds of the lung are the prominence given to exceptional cases of recovery after very severe injuries of the chest and the interest they naturally awaken,[2] and also the comparative frequency of examples that are to be met with in authors of recoveries after perforations of the chest by the rapier or bayonet, or by small pistol balls.[3] Confining their attention to a limited number of cases, some writers are betrayed into the error of regarding the latter group of injuries very lightly.[4]

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[1] The ancients were less sanguine than the moderns in this matter. Galen (Lib. V, cap. 26) pronounces deep wounds of the lungs fatal. John Tagault says (*Institutionum chirurgicarum Libri Quinque*, ed. Uffenbachii, Francofurti, 1610, Lib. II, c. iii, p. 736): "Vulnera autem quæ pulmonibus incidunt, ideo curatu sunt difficillima, imo magna ex parte insanabilia; quoniam promptissime phlegmonem excitant." RICHARD WISEMAN (*Severall Chirurgical Treatises*, London, 1676, Book VI, c. viii, p. 434 and p. 436) writes "almost all those wounds made by gunshot are mortal," and "many instances may be given of gunshots in the breast, but few do recover that are shot in the lungs. PLENCK says (*Instit. Chirurg.*, 1774) "Magna pulmonis vulnera absolute lethalia sunt."

[2] In reading the history of MAIDEN'S case (*An Account of a case of Recovery after the Shaft of a Chaise had been forced through the Thorax*, London, 1824, 4to), many readers do not pause to reflect that the preparation in the Royal College of Surgeons indicates that the lungs were not wounded, and that it is believed that the foreign body passed between the ribs and pleura. Dr. THOM (*loc. cit.*, p. 60) relates a somewhat similar case of recovery on the authority of Dr. Semple, though it was assumed that the gig-shaft, in this instance, "passed entirely through the right lung." The sequel of the yet more marvellous case of the Prussian sailor, John Taylor, impaled by a try-sail mast, treated at the London Hospital by ANDREWS, in 1831, is related in 1857 by Dr. A. C. GARRATT, of Massachusetts (*Boston Med. and Surg. Journal*, Vol. LVII, p. 488), who, on a voyage to Liverpool, encountered this man in perfect health, twenty-six years after the reception of his injury, with a large depressed semi-lunar cicatrix over the region of the heart, the organs of the chest on auscultation and percussion being perfectly normal. Dr. Garratt took the man to London, where he was recognized by Professors Partridge and Fergusson, and appointed janitor of the Museum of the London Hospital.

[3] Thus Dr. F. H. HAMILTON (*Principles and Practice of Surgery*, 1872) announces that "pistol balls, with small shot, seldom prove fatal when lodged within the chest, unless from wounds of the heart or great vessels." In sixteen cases of fatal penetrating gunshot wounds of the chest reported in the Army during the past five years (Circular No. 3, S. G. O., 1871, *A Report on Surgical Cases treated in the Army, etc.*, p. 29), three (CASES LXXVII, LXXXI, LXXXV) were instances in which a pistol ball or bird shot lodged within the chest without injury to the heart or great vessels. Of the first fifteen hundred cases of penetrating gunshot wounds of the chest entered on the registers of the late war, thirty-three were inflicted by pistol balls. Twelve of these were fatal. In six cases the ball emerged, in four it lodged within the thorax, in one in the glenoid cavity, in one this point is not noted.

[4] Thus Surgeon Middleton Michel, P. A. C. S., adduces (*Confederate States Medical and Surgical Journal*, p. 102), in his dissertation on "healing of gunshot wounds by first intention," illustrations of cases of rapid recovery after transfixion of the chest by the bayonet at Spottsylvania. He writes "That such prompt cicatrization occurs after punctured wounds, which depends, doubtless, upon the rapidity with which the track closes, through the elasticity of the separated tissues, I had several opportunities of ascertaining during the memorable fights of the 11th and 12th of May. In that remarkable assault on our breastworks, ten lines deep, in which the enemy exhibited unwonted boldness, and a persistent constancy of purpose only interrupted by night and only terminated by a disastrous repulse, a bayonet charge ensued which presented us with this class of wounds for the first time. Through the courtesy of my friends, Surgeon L. Guild, Medical Director of General Lee's army, and Surgeon J. T. Gilmore, Chief Surgeon of McLaw's division, and Surgeon Baruch, 3d South Carolina battalion, I examined several whose chests had been entirely transfixed by the bayonet, and who were all doing well. Their wounds healed in less than forty-eight hours; two had expectorated a little blood, but careful auscultation could detect no abnormal sounds; there was but little pain present, and no cough; no hæmorrhage of any account from the wound had been remarked. The men were seated up in their tents on the fourth day, eating, and the cordform and punctured wounds, indicating the heel and point of the bayonet, already healed, were well defined on the respective sides of the chest." It may be inferred that two of the cases mentioned are the same cited by Surgeon Baruch, 3d South Carolina battalion, at page 133 of the same *Journal*. These cases (*Finkler* and *Percival*) are noted on page 470 of this chapter, the reference to Dr. Baruch's paper being inadvertently omitted. Dr. Baruch is positive that the right lung was interested in Finkler's case, though the hæmoptysis was the only symptom of lung wound, and auscultation gave negative results. He is less confident in Percival's case: "When brought to the Infirmary, his countenance was pale and did not wear that expression of anxiety *so peculiar in penetrating wounds of the chest*; his symptoms indicated a shock to the nervous system, induced by the intense excitement of a hand-to-hand conflict with the drunken and infuriated foe." ("He was lying on his abdomen and partially on his left side behind a small rail-pile, when he was transfixed" is the immediately preceding statement.) "Acting on this supposition," Dr. Baruch, "administered some stimulants and anodynes, which partially restored the patient, and enabled him to recite his encounter with the enemy." * * "There was but slight dyspnœa, no cough, and but little bloody expectoration, indicating that the injury to the lung was not extensive. A careful investigation of the posture of the patient during the reception of the wound convinced me that the weapon grazed the right border of the posterior portion of the left lung, passing through the posterior mediastinum and evading the heart, which was displaced by the patient's lying on the left side." If the reader cannot thread his way through the labyrinth of breastworks "ten lines deep," nor determine

COMPLICATIONS.—The punctured, incised, contused, and gunshot wounds and injuries of the chest that have been examined, with some features in common, present so many differences that their classification is difficult. Though arranged for convenience as non-penetrating and penetrating wounds and injuries, this distinction by no means indicates their extent or gravity,—an innocuous puncture with a capillary trocar falling in the latter order, and ruptures of the heart or laceration of the lungs without external wound in the former. A division into injuries of the walls and of the contained viscera is not more favorable to strict definitions. It has therefore been necessary to consider these injuries according to the particular structures they involve and the complications to which they give rise. The latter may be divided into primary and consecutive. The primary complications are hæmorrhage, emphysema, and pneumothorax, hæmothorax, fractures of the bony and cartilaginous case and of the clavicle and scapula, hernia of the lung, and the lodgement of foreign bodies. The consecutive complications are intermediary hæmorrhage and hæmothorax, pleurisy, hydrothorax and empyema, pneumonia, abscess of the lung, carditis and pericarditis, erysipelas, gangrene, tetanus, pyæmia, secondary emphysema, fistula, and contraction of the side of the chest.

Hæmorrhage.—Bleeding in wounds of the chest is primary, intermediary, or, rarely, secondary, and proceeds from the superficial arteries, the intercostals, and mammaries, the pulmonary substance, the coronary arteries, and the heart and great vessels. Serious bleeding from superficial chest wounds was uncommon, yet, as mentioned in a note on page 519, the minor vessels sometimes bleed alarmingly after gunshot wounds. This is noted in only six cases, of which two were fatal of the eleven thousand five hundred and forty-nine cases classified as non-penetrating gunshot wounds of the chest. When the bleeding is not readily arrested by cold water and compression, the safe rule of exposing the bleeding vessel and placing ligatures above and below the wound should invariably be followed, without trifling with styptics.

Mention has been made of many wounds in the subclavian and axillary regions, in which the vessels were implicated.* In such cases, if the vessels were largely opened, immediately mortal hæmorrhage ensued. If the wound was narrow, or the orifice in the vessel obstructed by a foreign body, or the bleeding partially arrested by compression, a diffused aneurism formed. If the hæmorrhage was in a great measure controlled by pressure and plugging, the extravasation of blood resulted consecutively in a circumscribed aneurism. The results of ligating the proximal end of the main trunk were deplorable, and, in their discouragement at the want of success in ligations after wounds of the upper portion of the axillary, some surgeons regard it as most prudent to await the formation of an aneurism, and to practice an ulterior operation. But, whenever it is within the range of possibility, both ends of the injured vessel should be tied. It is very difficult to

which party was repulsed, he will at least think it probable that Finkler and Percival (whose heart was providentially displaced into the posterior mediastinum) were two of the sufferers, although he might not agree with Dr. Michel that the cases furnished an analogy for the healing of gunshot wounds by first intention, or partake of Dr. Baruch's conviction of the innocuity of bayonet wounds. "The limited experience derived from the treatment of these cases induces me," writes Dr. Barnch "to consider bayonet wounds as very simple injuries." * * "This dread of cold steel is, in my humble opinion, mainly attributable to ignorance of the nature of the injuries inflicted by it. There appears to exist in the minds of men a vague dread of transfixion by the bayonet. But this would not be so were it generally known that bayonet wounds are almost harmless when compared with the ploughed tracks which the terrible minié bores through the tissues." * * "A bayonet wound almost invariably heals by first intention under auspicious circumstances." * * "Why is it that soldiers have such a wholesome dread of the bayonet?" HENNEN tells us (*op. cit.* p. 374) that "bayonet's passing along or through the muscles covering the chest and its vicinity, demand a peculiarity of attention, solely from the danger of inflammation spreading to the pleura, or the lungs and heart, or of troublesome abscesses forming. In this view, the very slightest are interesting, and sometimes highly dangerous, particularly in persons disposed to pulmonic affections."

* I have followed M. Legouest in including these lesions with wounds of the chest, a classification which, I think, presents many advantages.—COMPILER.

distinguish the bleeding from the subscapular and circumflex branches from that of the main vessel, the degree of hæmorrhage and the cessation of the radial pulse being about the only signs to aid in the diagnosis. Wounds of the subclavian and axillary veins were controlled, in a few instances, by compression. In these injuries and in the operations which they require, the surgeon is confronted with the danger of the entrance of air into the vein, a subject which Wepfer, Bichat, and Nysten, and, in this country, J. C. Warren, have particularly called attention.[1] Simultaneous lesion of the axillary artery and vein gave rise to aneurismal varix in three cases of incised wounds recorded by D. J. Larrey.[2] This condition may result likewise after gunshot wounds, as was observed by Dupuytren and reported by Bérard.[3] A case of successful ligation of the subclavian for aneurism reported by Dr. Josiah C. Nott,[4] in 1841, is also cited as arterio-venous in its character. Dr. J. P. C. Wederstrand,t[5] also reports an aneurismal varix following a gunshot wound of the subclavian vein and artery, which the patient survived seven years, when he died from an intercurrent disease. M. Legouest[6] details a case resulting from a musket ball wound in the left axilla, at Balaclava.

In the eight thousand seven hundred and fifteen cases of penetrating wounds of the chest, hæmorrhage is noticed as a grave complication in three hundred and forty-six cases, of which one hundred and thirty-seven resulted fatally. In the four hundred and eleven abstracts contained in this chapter, hæmorrhage was a prominent feature in one hundred and one.[7] Enough evidence has been adduced of the dangers of lesions of the internal mammary and intercostal to prove that they are not to be discussed in the tone of levity some writers have adopted, six cases of the former and eleven out of fifteen cases of the latter having proved fatal. When the difficulties of ligating these wounds cannot be surmounted, the efficacy and security afforded by Desault's simple mode of compression by a pouch stuffed with lint should be borne in mind.

Some examples have been given with a view to prove that hæmorrhages resulting from injuries of the subclavian, primary carotid, and even the innominate vessels, should not be regarded as without the legitimate pale of operative surgery. The brilliant cases of ligation of the subclavian by Professor Billroth,[8] during the recent Franco-German war, should be compared with these cases, and the question examined anew if it is not possible to save life under these circumstances, or at least to postpone the fatal issue by operative interference.

Wounds of the heart and great vessels have been already noticed, and, if space permitted, the pathological material in the Museum and the literature of this interesting

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1 All the cases anterior to his time are cited by MORGAGNI, *De Sedibus et Causis Morborum*, Epis. V, § 21 sqq. See MAGENDIE, *Sur l'Entrée accidentelle de l'Air dans les Veines, sur la mort subite qui en est l'effet*, in the *Journal de Physiologie Experimentale*, T. I, 1821, pp. 190–199; LEROY (d'Étiolles) *Notes sur les Effets de l'Introduction de l'Air dans le Veins*, Arch. Gén. de Méd., 1823, T. III, p. 410, Juillet, 1824, p. 430; SAUCEROTTE, *Des Effets produits sen l'Économie animale par la Présence de l'Air atmosphérique dans l'appareil circulatoire*, Thèse de Strasbourg, 1828; DELPECH, *Memorial des Hospitaux du Midi*, November, 1830; LANGENBECK, *Beiträge zur chirurgischen Pathologie der Venen*, Archives, Berlin, 1861, Erster Band, S. 1; WATTMANN, *Sicheres Heilverfahren bei Lufteintritt in die Venen*, Wien, 1843.

2 LARREY, D. J., *Clinique Chirurgicale*, T. III, p. 139, and *Bulletin de la Faculté de Médecine*, T. III, p. 27.

3 *Dictionnaire de Medecine* (en XXX) Paris, 1833, T. IV, p. 510.

4 NOTT, J. C., Am. Jour. of Med. Sci., N. S., Vol. II, p. 111, and Annales de la Chirurgie Française et Étrangère, T. IV, p. 120, and *London Medical Gazette*, October 22, 1841, p. 158.

5 WEDERSTRANDT, *New Orleans Medical News and Hospital Gazette*, 1854.

6 LEGOUEST, *Chirurgie d'Armée*, 2d ed. p. 323.

7 In the twenty-three cases of penetrating gunshot wound of the lung that came under treatment in the New Zealand War (MOUAT'S report, already cited, p. 15), six terminated fatally from primary, and three from intermediary, hæmorrhage.

8 BILLROTH, *Chirurgische Briefe* u. s. w. S. 122. Brofessor Billroth tied the subclavian three times and assisted at two other ligations for bleeding from the main trunk. One of the patients is believed to have ultimately recovered. I may here mention that I am informed by Dr. White, of New Orleans, that he examined the patient on whom Dr. Smyth, in 1864, successfully ligated the innominata, in the summer of 1872, and found the man in tolerable health, though a small tumor with an aneurismal thrill, had reappeared.

subject might be profitably reviewed.[1] I can here only refer to specimen 3388, figured on page 588, as suggesting a possible explanation of the mode in which balls and other foreign bodies may gain admission to the cavities of the heart without leaving any trace of wound in the walls of that organ, viz., by gradual absorption of the wall of pulmonary vein compressed by the extraneous body. There appears to be no means of accounting for the recorded facts relative to the presence of balls in the hearts of deer, hogs, etc., without the slightest evidence of any lesion of the cardiac walls. And I may mention, briefly, that Dr. Carvallo's case[2] of non-penetrating gunshot wound of the left ventricle, was attended with division of large branches of the coronary artery, as in the cases recorded by Lamotte[3] and Larrey.[4] Hæmorrhage from wounds of the smaller pulmonary vessels, and from laceration of the lung tissue will be considered under the head of hæmothorax.

Emphysema.—The supervention of emphysema is noted in only thirty-eight of the eight thousand seven hundred and fifteen cases of penetrating wounds of the chest. In the four hundred and ten abstracts in this chapter, its presence is noted in seven cases only. The following is an example of this complication in which some details are related:

CASE.—Private William H. Mansfield, Co. D, 13th New York Cavalry, aged 21 years, was wounded while attempting to pass the line at Piedmont, October 19th, 1864, by a conoidal ball, which passed through the muscles of the left arm near the shoulder, entered the chest near the axilla, passed through the cavity, from which it emerged between the fourth and fifth ribs, and lodged beneath the integument between the scapula and the spine. A considerable degree of emphysema supervened in the tissues about where the missile lodged. He was conveyed to the field hospital, where the ball was excised by Assistant Surgeon J. T. Burdick, 13th New York Cavalry. Cold compresses were applied, with continuous pressure to the back. Morphia and tincture of veratrum viride were freely administered. Quiet was enjoined, and the patient instructed to lay upon his left side. He recovered, with partial atrophy of upper lobe of left lung. Discharged from service in June, 1865. Not a pensioner.

The infrequency of this complication in the Confederate service is noticed by Surgeons Chisolm and Jeffery.[5] Dr. Williamson[6] bears similar testimony from the experience of the British officers in India. But, though rare, this complication is not so uncommon as these observations would imply.[7] It is probable that, the teachings of the last generation of military surgeons having dispelled the exaggerated apprehensions with which this phenomenon was regarded, its appearance in a limited extent was not always regarded as of sufficient moment to be specified.

Such was the influence exerted by the observations of Sauvages, Littre, Boyer, and Larrey,[8] that the celebrated Hennen wrote (*op. cit.*, p. 374) that "when I first entered on the practice of military surgery, the fear of emphysema actually haunted my hours of repose." But it has since been shown that, though a troublesome, it is not a dangerous symptom, and by no means a frequent one.

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[1] Consult the authorities cited in the note to p. 527 and refer to the preparation of Professor Theile, in the museum of pathological anatomy at Berne, in which a laceration of the arch of the aorta was not fatal for several months after the accident; also the recent case at Carlsruhe, which Professor BILLROTH alludes to (*op. cit.*, S. 113) and Dr. SOCIN describes (*Kriegschirurgische Erfahrungen*, u. s. w., Leipzig, 1872, S. 48: "Lecrepe, wounded at Wörth, August 6th, 1870, transferred to Carlsruhe. * * Copious hæmorrhage on the sixteenth day; death." Dr. KLEBS *Beiträge zur path. Anat. der Schusswunden*, Leipzig, 1872, S. 126, gives the notes of the autopsy made August 20th, 1870, and remarks on the slight primary bleeding.

[2] CARVALLO, p. 534, and Circular No. 3, S. G. O., 1871, p. 33, and Specimen 5929, Section I, Army Medical Museum.

[3] LAMOTTE. *Traité complet de Chirurgie*, Paris, 1781, T. II, p. 69. [4] LARREY. *Clinique Chirurgicale*, T. II, p. 291.

[5] CHISOLM. (*A Manual of Military Surgery*, 3d ed. p. 319): "It is a sign which our extensive experience shows to be rarely present." JEFFERY, R. W., Surgeon C. S. N. (*Confederate States Med. and Surg. Jour.*, vol. I, p. 39), describes a gunshot wound of the lung attended with emphysema, in a seaman of the C. S. Steamer Isondiga, and remarks, in 1864: "Since the beginning of the war, this is the second case of wounded lung in which, if my memory serves me aright, I have seen emphysema, and in which there was no expectoration of blood." So, also, the authors of the Confederate *Manual* observes of emphysema: "It is not common after gunshot wounds, but occasionally happens."

[6] WILLIAMSON. *Military Surgery*, p. 76: "It is seldom that emphysema follows a gunshot wound, but is somewhat more common immediately after sword or lance wounds, but not so frequent as was formerly supposed."

[7] MOUAT. *British Stat. San. and Med. Rep.*, 1865, Vol. VII, p. 487. In the twenty-three detailed reports of penetrating chest wounds in the New Zealand war, the presence of emphysema is noted in six, of which five had a favorable termination.

[8] BOISSIER, vulgo DE SAUVAGES, *Nosologia methodica sistens morborum classes*, Amsterdam, 1763. LITTRE, *Mém. de l'Acad. des Sciences*, 1713 p. 4 et sqq. BOYER, *Traité des Maladies chirurgicales*, Paris, 1846, T. V, p. 613. Boyer states that the humors of the eye even contain air-bubbles in some cases. LARREY, D. J., *Clinique Chirurgicale*, T. II, p. 88. This great surgeon falls into the error of stating that "la plupart des plaies pénétrantes de la poitrine sont suivies d'un emphysème plus ou moins considérable." He gives an excellent plate of a generalized traumatic emphysema (*op. cit., Atlas*, T. II, pl. 4), which has been often copied.

It will be understood that traumatic emphysema is exclusively considered here. The inflation of the pulmonary air vesicles, termed emphysema by the physician, a condition sometimes resulting in the production of bullæ on the surface of the lungs, and rupture and pneumo-thorax, is occasionally observed in military surgery, in laceration of the lung by concussion, but is quite distinct from the condition under consideration.

The older authors were in error not only regarding the frequency of emphysema in penetrating wounds of the chest, but in relation to its importance as a sign of lung wound. It is of so little importance in this respect, that I treat of it here instead of with the symptoms in the subsection on diagnosis. Yet great faith has been placed in this sign. Lamotte and Ferrein[1] put it down as a certain sign of lung wound. But Dr. Fraser's analysis of modern observations[2] proves that emphysema may follow penetrating wounds of the chest with or without injury to the lung, complicated or not with fracture of the ribs. In fifty-one cases of penetrating gunshot wounds of the chest studied by this author (*op. cit.*, p. 66), emphysema was present in seven. Four of these were fatal cases, and the lung was found wounded in three of them. Hennen (*op. cit.*, p. 380) says of emphysema: "The plain fact is that it does not occur in one case in fifty," and Neudörfer (*op. cit.*, p. 377) remarks that "according to observations made in the wars of the last twenty years, it appears to follow injuries of the chest in only one out of two hundred cases, and that cases of its extension over the entire surface have not occurred at all." John Bell[3] and C. Mayer[4] remark upon the greater frequency of emphysema in stabs than in gunshot wounds. This is probably due to the want of parallelism, in stabs, of the tegumentary and intercostal orifices. But Baudens[5] and Dr. Stromeyer[6] offer another explanation of the rarity of emphysema in gunshot wounds: "That the ball passing into the substance of the lung bruises it and causes an immediate extravasation of blood in the lung substance, so that no air can pass from the air-vesicles or small tubes into the pleural cavity." And Baudens conceives that the bronchial tubes possess a resiliency analagous to that of the arteries.

The treatment of emphysema is very simple. If the wound is oblique, the external and internal orifices are to be made parallel by an incision through the skin and muscular tissue, as inculcated by Larrey (*loc. cit.*, p. 888). The movements of the chest are to be confined by a bandage, and, if the extension of the crackling tumor is oppressive, the air is to be liberated, as advised and practiced by Wiseman[7] and William Hunter[8] and more modern authors,[9] by puncture or incision.

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[1] LAMOTTE, *op. cit.*, 2ème *éd.*, T. III, *Des Playes de la poitrine;* FERRIEN, ANT. *Élémens de Chirurgie pratique*, Paris, 1771.

[2] The British Director-General's Report, p. 63, says: "The wound was soon followed by emphysema, * * showed unmistakeably that the lung had been injured." The same opinion is held in the *Lancet*, February 14th, 1852; and in the *Medical Times*, December 17th, 1853, the proof of lung wound given is "emphysema and dyspnœa;" and in the same journal, on April 6th, 1841, emphysema is again adduced as a sign of lung wound; and on April 27th, 1850, in the same journal, a case is related in which emphysema was present, but no other symptom of lung wound. Preparations of cases in which emphysema existed when the lung was wounded are to be found in the museums of St. George's and Guy's Hospitals.

[3] JOHN BELL. *Discourses on the Nature and Cure of Wounds*, 1795, Part II, p. 11.

[4] C. MAYER. *Tractatus de Vulneribus pectoris penetrantibus*, Petropolis, 1823, p. 28.

[5] BAUDENS. *Clinique des Plaies d'Armes à Feu*, Paris, 1836, p. 260. [6] STROMEYER. *Maximen der Kriegsheilkunst*, Hannover, 1855, S. 602.

[7] WISEMAN (*Severall Chirurgicall Treatises, Folio*, London, 1676, Book V, p. 368). "A footman was wounded into the left side: He cought bloud and discharged much by the Wound. * * Some few days after, a Tumour arising about a wound, I gave him a visit and felt the swelled Parts crackle under my fingers. Concluding it Wind got out from the cavity within the *Thorax*, I made an Incision into the Swelling about an inch long, by which the Wind was discharged."

[8] HUNTER, WILLIAM. *Medical Observations and Inquiries*, Vol. II, p. 17, with characteristic elegance and correctness, describes this condition and the proper remedy.

[9] LOHMEYER, C. F. (*Die Schusswunden*, u. s. w., S., 133). "Trifling degrees of emphysema generally disappear after the application of a soft compressive bandage, which at the same time fixes the ribs that may have been fractured, as it principally enforces the respiration by motions of the diaphragm. But when the emphysema over the larger portion of the body extends, the air may be liberated by puncture or incision of the skin, or its farther extension into the cellular tissues may be prevented by enlarging the wound, that the air filling the pleural cavity be forced directly outward during expiration."

M. Gosselin[1] maintains that contusions of the chest, attended by lacerations of the lung substance with integrity of the visceral pleura, may cause emphysema. Perhaps the case[2] in Guy's Hospital, cited by Dr. Fraser (p. 66) as a proof that "emphysema, taken by itself, is not a certain sign of lung wound," was of this character.[3]

Fractures.—The gravity of penetrating wounds of the chest was much augmented by the existence of fracture, especially if the lesion of bone was at the point of entrance. It was formerly believed, and is still maintained by Neudörfer,[4] that all gunshot perforations of the chest are attended by fracture; but many instances have been adduced in this work, in which balls have entered and emerged through intercostal spaces, or broken the ribs only in exit. Unquestionably the size of missiles is here an important element, and its influence is apparent in the mortality rate of chest wounds. Dwelling upon this point, Dr. Socin, in his recent work,[5] maintains that his statistics disprove Dr. Neudörfer's statement that "the intercostal spaces are too small to allow even the Prussian *Langblei* to slip through," and asserts that it is indubitable that the small chassepôt missile may pass through most of the intercostal spaces without interesting the bones, and contends that "with the late improved arms, perforating gunshot wounds of the chest are not rare," and that "this, no doubt, is one of the causes of the more favorable results lately obtained."

In the reports of the eight thousand seven hundred and fifteen penetrating wounds accounted for in TABLE XXVI, page 606, the presence of fracture of the ribs, in cases in which the missile was believed not to have entered the thoracic cavity, is mentioned in four hundred and forty-six cases. In cases attended by penetration, it is referred to in only five hundred and five cases, of which two hundred and four were fatal, although it existed, in all probability, in the majority. The complication of chest wounds by fractures of the sternum is recorded in fifty-one cases, by fractures of the vertebræ in ninety-two cases, by fractures of the clavicle in one hundred and thirty-six cases, and by fractures of the scapula in three hundred and seventy-five cases. This, however, is a very imperfect summary. It includes only the cases in which the lesion named is directly specified in the

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1 GOSSELIN (*Recherches sur les Déchirures du Poumon sans Fractures des Côtes correspondantes*, Mém. de la Soc. de Chir. de Paris, 1847, T. I, p. 234.

2 See a case in *Guy's Hospital Reports*, Second Series, Vol III, seventh case in Table II, p. 147: a "contused wound on the right side, opposite the eighth rib, from a fall on a spike; *no fracture*; emphysema of nearly the whole side of the chest; no symptoms whatever.

3 CREUZENFELD (*Bibliotheca Chirurgica*, Vindibonæ, 1781, p. 665) compiles, mainly from WALTHER and HALLER, three quarto pages of reference, to writers on empneumatosis or emphysema. Among those interesting to the military surgeon are the observations of SMETIUS (*Miscell. Med.*, Franc, 1611, Lib. IV), "de enormi emphysemate ex pectoris vulnere, quod die quinto evanuit;" BARTHOLINUS (*Hist. Anat. Cent.*, Hafniæ, 1654, Cent. V, Obs. 12), "emphysema ex pulmonis vulnere;" a case reported by PETER ESTANNE (in Riviere's *Obs. Med.*), "de emphysemate a vulnere pectoris:" WORM (*Epist. Posth.*, Hafniæ, 1651), "A vulnere pectoris emphysema;" REIES (*Elysius jucundarum quæstionum campus*, Bruxell, 1661), "emphysema a pectoris vulnere;" PAULUS DE SORBAIT (*Examen Chirurgorum*), "de emphysemate in pectoris vulnere;" LITTRE (*Comment. Acad. Sci.*, Anno 1713), "de emphysemate;" PETIT (*Traité des Mal. Chir.*, 1790, T. I, p. 124), "des plaies de poitrine;" ASTRUC (*Traité des Tumeurs et des Ulcères*, Paris, 1759); SCHULZE, *De Emphysemate*, Thesis, Halæ, 1733 (in Haller's *Disp. Chir.*, Vol. II, p. 567); HEWSON, *On Emphysema and Wounds of the Lung*, in *Path. Obs. and Enq.*, London, 1767, Vol. III, p. 372; WILLIAM HUNTER (*Med. Obs. and Inq.*, Vol. II, p. 17). Sir ANDREW HALLIDAY (*Observations on Emphysema*, London, 1807) has collected most of the observations and experiments of his predecessors and added much valuable material of his own. Consult also the articles by BRESCHET, MURAT, BÉGIN, and JACQUEMET, in the French Dictionaries, and LASSUS (*Path. Chir.*, T. II, p. 331); ABERNETHY (*Surgical and Physiological Works*, London, 1830, Vol. II, p. 171); JOHN BELL (*Discourses on Wounds*, Part II, p. 11); RICHTER (*Anfangsgründe der Wundarzneykunst*, B. I, S. 451); and, among later writers, DUPUYTREN (*Clin. Chir.*, T. I, p. 110); MALGAIGNE (*Du Traitement des grands Emphysèmes traumatiques*, in Bull. de Thérap., T. XXII, p. 352); DOLBEAU (*De l'Emphysème traumatique*, Thèse d'aggregation, 1860).

4 NEUDÖRFER (*Handbuch der Kriegschirurgie*, Leipsig, 1867, S. 581): "Alle perforirenden Schussverletzungen der Brust sind mit Knochen- oder Knorpelverletzungen combinirt. Der Intercostalraum ist auch beim Erwachsenen zu klein, um ein Projectil glatt durch schlüpfen zu lassen."

5 SOCIN, A., *Kriegschirurgische Erfahrangen gesammelt*, in Carlsruhe, 1870 und 1871, Leipzieg, 1872, S. 84. The *Langblei*, or missile of the Prussian needle-gun, is an ovoid solid slug. The specimen in the Museum (No. 4737, Sect. I) weighs 514 grains and has a calibre .56 of an inch. The chassepôt missile weighs 380 grains and has a calibre of .43 of an inch. The heavy Russian ball used in the Crimea, and many of the conoidal balls of large calibre employed in the War of the Rebellion almost invariably inflicted fractures in striking the chest.

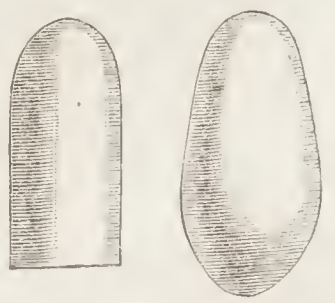

FIG. 302.—The projectiles of the chassepôt and needle-gun. (After MacCormac.)

report, omitting those where its existence could readily be inferred. Moreover the numerous cases in which, for example, the clavicle, scapula, and ribs were fractured simultaneously, are entered but once, under the head of the injury which was regarded as the most severe.

The special gunshot fractures of the clavicle, scapula, sternum, and ribs, and the operations which they sometimes involve, have been fully illustrated in preceding portions of this chapter, and those of the vertebræ, in Chapter IV. The general conclusion that formal primary excisions of the bones of the trunk for injury are very rarely required, has been corroborated by the recorded experience of military surgeons abroad, during more recent wars. Though exceptional or hypothetical cases might be presented, in which partial or complete excisions of the clavicle or scapula might be justifiably practiced, the reparative powers of nature are known to furnish excellent results in grave injuries of these bones, and it is generally agreed that the removal of "primary sequestræ," or entirely detached fragments, should be commonly the limit of operative interference. Where extended necrosis occurs, judicious surgical intervention may be of great benefit.[1]

In compound fractures of the ribs, it is commonly recommended that the splintered extremities should be resected or smoothed off, especially if the splinters are directed inwards. But this is a theoretical rather than a practical precept. Dr. Fischer (*op. cit.*, p. 116) states that in his extended experience he has had occasion but once to have resource to this expedient. Unless bound down by the pleuritic adhesions, the lung usually recedes far enough from the projecting splinters to avoid laceration. If necrosis supervenes, the rib becomes so separated from the soft parts that partial excisions are facilitated. Dr. Pirogoff[2] warmly inveighs against early interference in these cases. Professor Gross,[3] however, has "met with shot wounds of the chest where the ribs were so much shattered as to require removal with the cutting pliers." But he adds "the instances demanding such a procedure must be uncommon."

A number of examples of gunshot fractures of the sternum have been detailed. These injuries are interesting from the frequency with which they are complicated by lesions of the internal mammary or of the pericardium and great vessels, or by the lodgement of balls, and because of consecutive necrosis and abscesses in the mediastinum.[4]

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[1] Besides the operations on the scapula referred to in the text and note at p. 557, the reader may refer to the cases of Drs. E. M. Bartlett (*St. Louis Med. and Surg. Jour.*, 1854, Vol. XII, p. 64), and T. M. Owens, of Arkansas (*New Orleans Med. and Surg. Jour.*, Vol. XI, p. 164, 1854); Wutzer's case, in Ortbach's dissertation, Bonn, 1835; a successful case recorded by Esmarch in a dissertation published at Kiel, in 1859; and cases by Mazzoni and Biagini, in the *Gazette Méd. de Paris*, 1854, and *Bulletin de Thérap.*, T. VI; SYME (*Fracture of the body of the Scapula*, Edin. Med. and Surg. Jour., April, 1831); SMILEY (*Twenty cases of Gunshot Wounds*, Boston Med. and Surg. Jour., 1863, Vol. LXVIII, p. 412) reports a case of gunshot fracture of spine of the scapula, with extraction of fragments. For operations on the clavicle refer to DAWSON, W. W. (*Excision of the Entire Clavicle*, Boston Med. and Surg. Jour., Vol. II, p. 95, 1868–69); TRYON, J. R. (*Exsection of Right Clavicle*, Am. Jour. Med. Sci., Vol. XLIX, p. 357, 1865); IRVINE (*Excision and Regeneration of the Entire Clavicle*, London Lancet, 1867, Vol. I, p. 206).

[2] PIROGOFF (*Grundzüge der Allgemeinen Kriegschirurgie*, S. 537): "Stromeyer und Demme sprechen sogar von der Rippenresection; welche in dem holstein'schen und italienischen Kriege—im letzten, wie es scheint, selbst frühzeitig—bei comminutiven Rippenbrüchen vorgenommen worden war. Gott sei Dank, dass uns das noch fehlte!"

[3] GROSS, A., *System of Surgery*, Vol. II, p. 446, 1872. Consult also DIDIER, *De Costarum Fractura*, Paris, 1764, T. IV, p. 686; VERDUC, *Pathologie de Chirurgie*, Paris, 1703, p. 395; MALGAIGNE, *Recherches sur les Varietés et la Traitement des fractures de Côtes*, in Arch. Gén. de Méd, 1838; GÜRLT, E., *Handbuch der Lehre von den Knochenbrüchen*, Hamm, 1864, Zweiter Theil, S. 191; DIEFFENBACH, J. F., *Dic Operative Chirurgie*, Leipzig, 1848, Zweiter Band, S. 400.

[4] LA MARTENIÈRE (*Sur l'Opération du Trépan au Sternum*, in Mém. de l'Académie Royale de Chirurgie, T. IV., p. 545), to whom I have not sufficiently expressed my obligations on the notes to p. 572, gives an excellent account, with cases, and a handsome plate, of the injuries and diseases of this bone, and the operations practiced on it. Consult also the learned FREIND'S (*The History of Physick; from the Time of Galen to the beginning of the Sixteenth Century*, London, 1726) account of the descriptions by Avenzoar and Salius Diversus of abscesses of the mediastinum. Most of the older surgeons refer very deferentially to the opinions of REALDUS COLUMBUS on perforations of the sternum, in his work *De re anatomica*; but Paré desired that he should have treated more fully of diagnosis. (PURMANN, M. G. (*Lorbeer-Krantz oder wundartzney*, Franckfurth und Leipzig, 1692, p. 480) treats at length of the subject, and practiced the operation of trepanning the sternum. Among the moderns, consult SABATIER, *Mémoire sur les Fractures du Sternum*, in Mém. de l'Institute, an VII, T. II, p. 115; RICHERAND, *Leçon du citoyen Boyer sur les Maladies des Os*, 1803, T. I, p. 99; DUBOS, *Maladies du Sternum*, Thèse de Paris, 1835. ASHHURST, *On Fracture of the Sternum*, Am. Jour. Med. Sci., N. S. Vol. XLIV, p. 406.

Hernia of the Lung.—This complication has been fully considered in the subsection beginning on page 514. I have only to add that it has been very rarely observed in the late wars in Europe; descriptions of only two cases having been found recorded by recent writers. These cases were observed by Dr. H. Beaunis,[1] at Juranville, in an ambulance of the Army of the Loire.

Lodgement of Foreign Bodies.—A hundred and ninety-four examples have been adduced to illustrate the numerous varieties of lodgement of missiles, fragments of clothing and equipment, and other foreign bodies, and it is hoped that sufficient evidence has been accumulated on this point to guide the practitioner to the safe middle path between the rash interference and timid and harmful non-interference. The instances in which foreign bodies remain sacculated and innocuous within the tissues for lengthened periods, have been shown to be very rare in comparison with those in which serious mischief and danger ultimately arose. The peace of mind which the extraction of the foreign substance invariably induces in the patient is, in itself, a strong reason for using every judicious means for their removal. It has been seen that foreign bodies may be buried either in the soft parts, bones, or viscera, of the thorax, or be loosely in the pleural, pericardial, or mediastinal spaces. No attempts to remove them from the two latter situations were reported. The judicious cautions of systematic writers on the use of the probe have received due attention, and it has been shown that they do not always apply to old cases, or all recent cases, and that careful exploration with the finger or gum catheter may sometimes be more judicious than abstention, and the circumstances justifying interference have been fully illustrated. Examples of the expectoration of balls in coughing, and of their escape through the thoracic walls and intestinal canal have been cited. A general survey of the long series of cases, while leading to the inference that foreign bodies sooner or later produce grave accidents, favors a belief in the possibility of recovery with lodgement.*

The other primary complications of penetrating wounds of the chest may be most conveniently considered with those that are consecutive. Of these the most important are the visceral inflammations:

Traumatic Pleurisy.—This, according to the received doctrines, attended, in a greater or less degree, all of the cases of penetrating wounds of the chest; but the instances in which it is referred to as the most prominent complication number only nine-four, fifty-two

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1 BEAUNIS. *Impressions de Campagne.* In Gazette Médicale de Paris, 3ème Série, T. XXVI, No. 52, p. 593, December 30, 1871. "We had seventeen cases of penetrating gunshot wounds of the chest, out of which there were four deaths in the first fortnight. There were two cases of hernia of the lung. One of these men died a few days after the reception of the wound; in the other, I ligated the protruding portion of the lung, which was of the size of an egg; and the fourth day after, the day of our departure, no serious symptoms had supervened. In neither of these cases was there any tendency towards the spontaneous reduction of the tumor."

* See MANEC, case of an iron blade lodged in the lung substance for fifteen years (*Bulletin de la Société Anatomique*, Paris, 1829, p. 51); BERCHON'S (*Gazette Médicale*, 1861, pp. 209, 225, 1241) rectification of the history of the convict at Rochefort, cited by many authors, in whose chest, between the first and fourth ribs, was found the fragment of a knife-blade 83 millimètres (3⅓ inches) in length, which had wounded the lung and lay in an indurated canal, formed at its expense, according to GAILLER (*Presse Médicale*, T. I, p. 51). NISLE (*Arch. gén. de Méd.*, 1831, T. XXV, p. 253) gives the case of a man wounded in 1814, who died of a cerebral disorder in 1830, and, at the autopsy, the ball was found in a cavity of the size of an egg, in the lower lobe of the right lung. MOORE, of Plymouth (*London Lancet*, January 9th, 1847), gives a case in which a ball lodged near the surface of the lung for fifty years. M. HIPPOLYTE LARREY (*Relation Chirurgicale des Événements du Juillet*, 1830) cites two cases of ball lodgement. Surgeon ARNOT, of the Grampus (*Medico-Chirurgical Transactions*, Vol. XIII, 1827, p. 281), reports a case of a piece of hoop-iron removed from a cyst in the left lung, opposite the third rib, where it had remained for fourteen years, the sailor, a man 44 years of age, having been wounded in 1812, and dying from inflammation of the lung in 1826. LEASH (*Catalogue of the Museum of the Royal College of Surgeons*) reports the history of Henry Barrot, 1st Life Guards, wounded at Waterloo, June 15th, 1815, in the left thorax; he lived forty-two years and a hundred and seventeen days. The ball was found in an abscess containing a pint of pus. In cases in which a blade is impacted in a rib and broken short off, Gérard's expedient of pushing it out with the finger protected by a thimble, within reach of the forceps, must not be forgotten. See in the Army Medical Museum, SECT. I, *Spec.* 961, a wet preparation of lung, with a piece of bone driven into its substance by shot. Case of John W. L——, Co. D, 3d Wisconsin, aged 20, wounded at Antietam, September 17th, 1862; admitted to General Hospital at Frederick, September 24th; died October 28th, 1862.

of which were fatal. Surgeon J. T. Woods observes, of the chest wounds he treated at Chickamauga:

"I have been astonished at the non-occurrence of pleuritis, the wounds being ragged, injuring twice both thoracic and pulmonary pleuræ with spiculæ of ribs sometimes thrown inward, to irritate the parts and aid in exciting this result; but, in these cases, the symptoms of pleuritis were both infrequent and mild."

Mr. Erichsen says[1] "whenever the pleura is wounded, * * whether the lung be injured or not, pleurisy necessarily sets in." But Dr. Fraser (*op. cit.*, p. 78) believes that "an inflammatory action in the pleural membrane is sometimes the effect of shot or bullet wound in the chest, but not a usual consequence." There can be no doubt that the expressions of the special student of this subject depict the true condition of things far more accurately than those of the systematic author.

When pleuritis arose after chest wounds, its symptoms and progress were not to be distinguished from those observed in the idiopathic form of the disease. Lymphy exudations took place, adhesions formed between the costal and pulmonic pleuræ, and serous effusions often ensued, as will be more fully described in treating of hydrothorax. The plastic exudations on the pleura were found in many fatal cases to be very thick and dense.

One of the most remarkable instances of this excessive thickening of the pleura, by inflammatory exudation following mechanical lesion of the lungs, is illustrated by the preparation No. 512, of the surgical series of the Museum, which is imperfectly figured in the accompanying cut (FIG. 303):

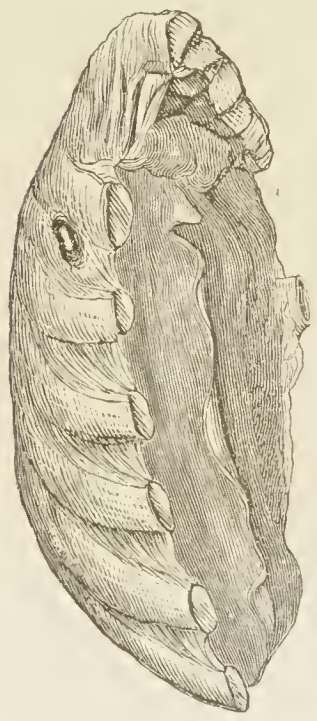

FIG. 303.—Section of the right thorax, showing a perforation by a musket ball through the first intercostal space, and extreme thickening of the pulmonary pleura. *Spec.* 512, Sect. I, A. M. M.

CASE.—Private William B———, Co. F, 6th Wisconsin Volunteers, aged 18 years, was wounded in the first battle in which his regiment participated, at Gainesville, August 28th, 1862, the first of the series of engagements included under the title of the Second Battle of Bull Run. He was shot through the right chest, and was left upon the field for several hours, but was finally provided with shelter at a field station of the First Army Corps. There was not much bleeding; but a frequent painful cough, with bloody sputa, and dyspnœa, and anxiety, and a quick small pulse. Occasional stimulants, with small anodynes, and cooling drinks, constituted the general treatment, and the local treatment consisted in covering the orifices of the wounds with compresses secured by adhesive strips. On September 2d, he was placed in an ambulance train, and, after a weary journey, over rough roads, of over thirty miles, he was admitted to College Hospital, Georgetown, September 6th, 1862, according to the memorandum of Acting Assistant Surgeon J. Morris Brown, "with a perforating gunshot wound of the thoracic cavity; the missile entered on the right side, between the first and second ribs, about one and a half inches from the costal cartilages, passed downward and backward, perforated the right lung, and emerged at the angle of the fifth rib, which it comminuted, besides chipping the sixth. There was effusion in the right pleura; sonorous râles; exaggerated breathing; he also spat blood." The prescription book of the hospital is the only guide to the progress of the case during the six weeks which elapsed before its fatal termination. Death resulted on October 21st, 1862. The necropsy revealed the track of the ball. The wood-cut (FIG. 303) represents a preparation of the right lung and of six ribs of the same side. The lung is collapsed and solidified and the pleura intensely thickened after inflammation, the pleura pulmonalis being about two and a half lines in thickness. There is a corresponding thickening of the costal membrane. The specimen was contributed, with a brief note of the case, by Acting Assistant Surgeon G. K. Smith.

Similar appearances are shown in specimen 3736, figured on page 588 (FIG. 289),[2] and in specimens 2424, 1142, 1315, and 696, of the Army Medical Museum. Intense local pleuritic exudation is displayed in specimen 515, case of S. B——, p. 490.

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[1] ERICHSEN, *The Science and Art of Surgery*, 5th ed., London, 1872, Vol. I, p. 436.

[2] Assistant Surgeon A. A. Woodhull, U. S. A., cites this preparation as a proof that pneumonia is not "a necessary consequence of gunshot wound of the lung. There is indeed no evidence that there was local inflammation at the time that the ball penetrated the lung substance, and though the exudations on the pleura are exceptionally profuse; yet, at the time of death, the lung tissue was pervious in near proximity to the ball, floating in water, and showing little if any trace of inflammatory engorgement. In immediate juxtaposition with the ball, the lung tissue had undergone a cheesy metamorphosis.

The pleuritic exudations sometimes were observed to plug the wound, as if to repair the injury to the serous membrane, as was observed by Dr. John Thomson[1] after Waterloo, and by John Hunter in experiments on animals, from which he deduced that this was the natural process of cure.

Traumatic Pneumonia.—This is noted as a grave complication in two hundred and eighty-five of the penetrating and seven of the non-penetrating wounds of the chest, and resulted fatally in two hundred and twenty-two of the former and six of the latter group.

In an interesting report of 1,562 cases wounded after the battle of Antietam, at Hospital No. 5, at Frederick, Surgeon Henry S. Hewit, U. S. V., makes the following observations on wounds of the lung:

"Sixteen cases of wounds of the thorax and lungs have been received. The number of cases of undoubted penetration or abrasion of the lungs was fourteen. Temporary recoveries of unmistakable lung wounds have occurred in six cases. The word temporary is used advisedly. The final result of penetration or abrasion of lung tissue is doubtful in every case, and ultimately fatal in most. The temporary recoveries have exceeded the proportion of the best foreign military hospitals. This favorable result is undoubtedly due in a great measure to the season of the year and the warmth and dryness of the Maryland autumnal climate. The rapid recurrence of traumatic pneumonia complicated and obscured the physical signs, and the earlier deaths took place before means were provided for *post-mortem* examinations. In all the fatal cases in which autopsies have been made, traumatic lesions of the lung tissue were discovered, the original injury, however, masked by the products of excessive inflammation and purulent infiltration; in two instances passing rapidly into gangrene. It was remarked that the passage of the ball through and through was more unfavorable than where it remained in the cavity. No instance has been known of a ball lodging on the diaphragm. One such case was diagnosticated by a surgeon, but the bullet was subsequently removed from the centre of the *quadratus lumborum*. The treatment pursued in all the cases of lung wound was that of nutrition and stimulation. Hurried respiration was quieted by aconite, and exalted heart action subdued by veratrum viride. The administration of these remedies was seldom required more than a few times. In obviously fatal cases from this as well as other causes euthanasia was sought for and promoted by morphine, administered hypodermically or through the wound where possible. The fatal cases rapidly assumed the characteristic appearances of the closing period of rapid consumption, accompanied to the last by clear intelligence and the remarkable buoyancy of spirit which often co-exists with the suppurative disintegration of this vital organ. I have observed no instance of traumatic pneumonia extending to the opposite lung. The conservatism of nature is manifested in the effort at limitation and arrest of inflammation and suppuration, and in the extraordinary success occasionally observed in cases apparently the most hopeless."

Surgeon Hewit accompanies his report with the following abstracts compiled by his assistant, Dr. Cherbonnier:

CASE.—Corporal Emanuel Fulp, Co. C, 27th Indiana Volunteers aged 40 years, was wounded at the battle of Antietam, Maryland, September 17th, 1862, by a minié ball, which entered at the internal angle of the axilla, passed directly through the upper lobe of the left lung near its edge, and emerged at the infra-spinous fossa of the scapula. Acting Assistant Surgeon A. V. Cherbonnier, who reports the case, states: "When first seen by me, October 20th, 1862, he was suffering with some shortness of breath, pain in side, cough, and sputa slightly rusty. He had, as he informed me, spat blood only for a few days after the injury, and that in very small quantities. The wounds presented a healthy appearance, and the discharges were of a healthy color and proper consistency. The wounds were ordered to be kept perfectly clean, and to be dressed regularly twice a day, simple cerate being used. For the pneumonia that was apparent from the pain, shortness of breath, and sputa, and other physical signs, the patient was put upon Bennett's plan of treatment and with visible effect each day. On October 25th, some fragments of bone presented themselves near the point of exit and were removed. October 28th: All the symptoms better. The physical signs of the second stage perceptibly passing away and the lung assuming all the symptoms of mere engorgement. October 30th: Patient sits up and is cheerful; wound suppurating kindly; patient continued to improve, in fact, walked about the room,

1 THOMSON (*Rep. of Obs. in Mil. Hosp. of Belgium*, p. 91): "We saw several cases in which the external wounds having healed during the continuance of pleuritic inflammation, etc."

when, on November 8th, he had a chill, followed by fever, flushed face, and hurried respiration. The wounds looked dry and had suppurated but slightly on that day and the day previous. He continued to grow worse daily and died November 15th. *Post mortem* revealed the left cavity of the chest nearly filled with pus, which was very fœtid, and some serum in the pericardium. The lung was entirely collapsed, gray, and presented the appearance of a putrid mass."

CASE.—Private *R. W. Hill*, Co. K, 8th Louisiana Volunteers, was admitted to Hospital No. 5, Frederick, Maryland, November 23d, 1862, with a gunshot penetrating wound of the chest, received at Antietam, September 17th. A minié ball entered the right lung between the third and fourth ribs, going directly through the body. The case was progressing favorably on admission. He had been very low, and it was supposed for some time after the injury that he would die. When first seen at Frederick he was suffering with some cough—more troublesome at night—expectoration not profuse and catarrhal; right shoulder depressed and the chest considerably sunken below the point of entrance; the lung was quite solidified above; broncophony. The wound was still suppurating, though slightly. The suppuration had been very profuse, requiring dressing three or four times a day. On November 28th, 1862, he was sent to Richmond, at which time he felt quite able to travel and was in excellent spirits. Without the occurrence of any unexpected symptom he would recover entirely. Acting Assistant Surgeon A. V. Cherbonnier reports the case.

CASE.—Private Bernard McGofern, Co. A, 63d New York Volunteers, aged 41 years, by occupation a hempdresser, was wounded at Antietam, September 17th, 1862, and admitted to Hospital No. 5, Frederick, Maryland, on September 24th. This is another case of penetrating wound of the lung. Missile, unknown, but supposed to be a round ball, entered the left side of chest, passing through second and third ribs, making no exit. He spat blood for several days after injury; cough very troublesome and expectoration very profuse and thick. Treated after Bennett's plan, nourishing and stimulating diet, with marked benefit, the symptoms diminishing in intensity each day until his discharge from the hospital, December 20th, 1862. At the date of his discharge, he had little or no cough; muscular development fair; very slight shortness of breath, and the chest but slightly depressed. His spirits and appetite were excellent, and, as he expressed it, he felt quite well. The lung presented the following characteristics when he left: Vesicular murmur faint, but heard; bronchial respiration; lung not so resonant as in health. He is not a pensioner. Acting Assistant Surgeon A. V. Cherbonnier reports the case.

CASE.—Private Charles Eldridge, Co. E, 72d Pennsylvania Volunteers, was wounded at the battle of Antietam, September 17th, 1862, and admitted into Hospital No. 5, Frederick, Maryland, on the 23d. Acting Assistant Surgeon A. V. Cherbonnier states: * * "A conoidal ball entered at edge of posterior fold of axilla, injuring ulnar nerve (paralysis of fifth finger), penetrating lung, and emerging over middle bone of sternum. This certainly was the most interesting case that came to this hospital for treatment and was considered a hopeless one from the beginning. Patient very much emaciated; habitual cough; purulent sputa; matter for days emerging from sternum, sometimes amounting to four ounces a day; air also escaping from wound; left lung doing all the work; exaggerated breathing, and a state of hydro-pneumothorax in right lung; dulness over lower two thirds; cavernous breathing; lung pushed by fluid against spinal column; was kept constantly propped up in bed, unable to lie down; occasional cupping; attention to bowels and kidneys; generous diet; cod-liver oil and brandy. This case gradually and steadily improved. During the course of treatment he committed several excesses in diet, producing dysentery, which, however, readily yielded to treatment. On the 29th of December, he was transferred to Hospital No. 1. He had been walking about the ward two weeks before the transfer. Had applied for his discharge and was considered well able to travel. At the time of transfer right side of chest very much sunken; entire consolidation of lung below wound; above wound very slight vesecular murmur and symptoms of slow incipient phthisis." Eldridge was discharged March 6th, 1863, and pensioned February 21st, 1866. Examining Surgeon J. H. Gallagher reports that the volume of the lung is considerably impaired; that he has a constant hacking cough, accompanied by pain, and that deep inspiration causes tearing pain. His disability is rated one-half and permanent.

Surgeon J. T. Woods, 99th Ohio Volunteers, makes the following observations on the treatment of traumatic pneumonia in connection with the perforating chest wounds he reported after the battle of Chickamauga:

"The great danger is pneumonia, the treatment of which is not only delicate and difficult, but likely to prove unfortunate. No occasion was found for Guthrie's heroic phlebotomy or for active purgations. No indication for antimony or the impairing the blood's plasticity presented itself. The only plausible hope for successful treatment lies in early application of remedies, and in this matter lies an error fraught with fatality. The patients are mingled with others in crowds, the air is often impure, and this, with depressed and circumscribed respiratory power, adds fuel to the difficulty; examinations made are not sufficiently frequent and minute to detect the earliest manifestations of the disease while within the control of medication. Anodynes sufficient to allay the intense suffering are dictated both by philosophy and humanity, upon the detection of pneumonia in its early stages. The administration of tincture of veratrum viride sufficient to produce its sedative effect and thus arrest by crushing out the disease at once, has afforded most satisfactory results. The impression is made suddenly at the time selected by the surgeon, and, while it throws a barrier in the way of the inflammatory process, it leaves no traces of a destructive process of a permanent constitutional character. Great attention is required to the diet, which should at first be light and made more nourishing as the progress of diseased action taxes more severely the constitutional energies."

"Pneumonia is *an invariable sequence of wound of a lung*," says Mr. Erichsen,[1] in 1869, "and constitutes one of the great secondary dangers of this injury; the inflammation that is necessary for the repair of the wound in the organ having frequently *a tendency to extend to some distance* around the part injured, and not uncommonly to terminate in abscess." His American editor and commentator, Dr. Ashhurst,[2] is more guarded. "Pneumonia and pleurisy," he says, "(usually limited to the track of the wound) probably occur in most cases of lung wound, which are not rapidly fatal." Mr. Erichsen's statement appears to be founded on general inferences and imperfect observation; Dr. Ashhurst's concisely embodies the results of his analysis of the evidence on this point. Neither statement is based, apparently, on personal pathological investigation. It is certain that pneumonia, in the ordinary acceptation of the term, is *not* an invariable sequence of wounds of the lung. It is probable that it is not a frequent sequence. Mr. Erichsen proceeds to say that "traumatic pneumonia resembles in all its symptoms, auscultatory as well as general, the idiopathic form of the disease." This, again, is erroneous; for in a large number of wounds of the lung, the organ collapses, and a condition unfavorable to hyperæmia[3] is induced, and the auscultatory signs are modified. The lung does not play and the ordinary respiratory murmur is not produced. Dr. Fraser (*op. cit.*, p. 69) satisfied himself by experiment and autopsies that pneumonia was of rare occurrence after wounds of the lung. My own observations and dissections confirm me in the belief that his arguments cannot be successfully impugned.[4] It is obvious that in many of the reports of penetrating chest wounds in the War of the Rebellion, the existence of consecutive pneumonia has been taken for granted. Often there is no mention of the physical signs indicative of its presence, and, frequently, it is apparent that the term is not used in a strict sense; but that pleurisy, thoracic effusions, and almost any agglomeration of internal disorders are included under this title. Dr. Macleod (*Notes, etc.*, p. 234) refers to a Russian struck by a musket ball near the right nipple; the ball passed behind the sternum, fracturing it badly, and escaped close to the left nipple: "double pneumonia and pericarditis followed. The whole contents of the thorax were found implicated in one vast inflammation." This resembles many of the statements made in our reports. Dr. Macleod admits that he was not present at the autopsy, and his observation is valueless as regards the existence of inflammatory exudations in the lung substance. The truth is that there are so many circumstances to impede the military surgeon in arriving at a correct physical diagnosis, and in completing his observations, that deficiencies may well be excused. He is often in the midst of the noise and confusion of warfare; the wounded man cannot, perhaps, be placed in a convenient posture for auscultation; the facilities for necroscopic examination are not available. These considerations proportionately enhance the value of exact observations.

Dr. Klebs (*op. cit*, p. 83), in his report of the one hundred and twenty-nine autopsies of patients dying from the effects of gunshot wounds, at Carlsruhe, in 1870, records twenty *post-mortem* examinations in cases of shot wounds of the lung, and remarks of

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[1] ERICHSEN. *The Science and Art of Surgery*, 5th ed., London, 1869, Vol. I, p. 435. I have italicised the statements to which I particularly demur.

[2] ASHHURST. *The Principles and Practice of Surgery*, Philadelphia, 1872.

[3] Professor SCHUH (*Wiener Wochenschrift*, Jan., 1857) remarks that in shot wounds of the lung, one of the elements necessary to induce pneumonia, the rough and sudden inflation of air into the delicate lung structure, is wanting, as a wounded lung is partially, if not altogether, undilatable.

[4] I regret that I have been unable to finish, in season for publication in this place, drawings of microscopical preparations of lung tissue from the vicinity of tracks of punctured and shot wounds, selected from the thirty-one *post-mortem* examinations that I have made, demonstrating, in some instances, the non-existence of inflammation in close proximity to the wound. I shall avail of an opportunity of introducing them hereafter.

case 119: "Dagegen ist es der einzige von mir beobachtete Fall, in welchem sich von dem Schusskanal aus Pneumonie entwickelte." Of the fifty-one cases of penetrating wounds of the chest observed by Dr. Fraser, or collected in Dr. Matthew's report, only thirteen were attended by pneumonia. In not one of the nine fatal cases observed by Dr. Fraser, in which the lungs *were* wounded, did pneumonia supervene. It was present in one out of nine fatal cases in which the lung was not wounded, and in two out of twelve cases of recovery. It occurred in seven of the twelve fatal cases, and three of the nine cases of recovery reported by Dr. Matthew.[1] Commenting on a series of autopsies of patients dying from wounds of the lung, after the battle of Wörth, Dr. Socin[2] observes: "I was astonished to find at many autopsies how small the reaction was in the immediate vicinity of the injured parts. Generally the lung tissue around the track of the ball is only hepatized to the distance of two or three millimetres. Under such circumstances it is evident, that, if no bleeding occurs, and this may happen frequently by the bruised condition of the wound-canal, such an injury may heal completely without any serious symptoms."

I might accumulate much more evidence on this point, but I think from these facts we may correctly conclude with Dr. Fraser, that "pneumonia may be, but is not of necessity, a consequence of lung wound;" that when it occurs "it can rarely be diagnosed at so early a period after the receipt of the injury as to be useful as a diagnostic sign;" and that traumatic pneumonia differs from the idiopathic form in the absence, in the former, of exudations of plastic lymph in the air-vesicles, and of the spreading tendency of the constitutional affection; and in the rarity of pus formation, unless excited by the detention of foreign bodies.

Carditis and Pericarditis.—The comparative immunity from inflammation after injury, that we have observed in the parenchyma of the lung, when contrasted with the effects of wounds of its membrane, is yet more conspicuously displayed in the effects of mechanical lesions upon the heart and its serous envelope. Enough examples of wounds of the heart, in which the fatal issue was sufficiently delayed to afford time for the developement of inflammatory phenomena, have been observed to warrant the conclusion that parenchymatous inflammation of this organ is as infrequently the result of injury as of disease.[3] I have examined two cases where patients survived a fortnight or more after shot wounds grazing the heart, in which the pericardium was thickened and the visceral as well as the reflected layer of the pericardium was thickly coated with shaggy exudations; but the muscular structure presented no alterations discernible by the microscope.[4] If an analogy might be instituted between the effect of tension on inflamed striated muscle in the trunk or extremities, it would be inferred that the slightest degree of inflammation of the muscular structure of the heart would cause unendurable anguish in its movements

[1] MATTHEW (*op. cit.*, Vol. II, p. 321): "Extensive pneumonia did not appear to be a common occurrence. Pneumonic consolidation was more generally confined to the neighborhood of the injury, or at all events to the lobe implicated, and sometimes, as may be observed in the cases hereafter appended, the wound in the lung healed with hardly a trace of the inflammatory process in the substance of the organ."

[2] SOCIN, A., *Kriegschirurgische Erfahrungen* u. s. w. Leipzig, 1872, S. 75.

[3] See ROKITANSKI, *A Manual of Pathological Anatomy*. Translated from the German by C. H. Moore. Am. ed., Philadelphia, 1855, Vol. IV. p. 131.

[4] Compare RINDFLEISCH, *A Textbook of Pathological Histology*. Translated from the second German edition, by W. C. Kloman, M. D., Philadelphia, 1872, p. 231. "In the striated muscles of the trunk and the limbs it is conformable to experience that even the slightest degree of inflammation, for example, even that slight tumefaction which we find accompanying chronic rheumatism, and of which it has not yet been decided whether it essentially goes beyond a considerable degree of hyperæmia, is combined with the severest functional disturbance. The muscle rests in a contracted condition. The slightest attempt to stretch it meets with the most decided resistance from the patient, because of its painfulness. If we attempt to transfer these experiences to the heart it is readily manifest that even the slightest degree of diffuse inflammation must have, as a consequence, the stoppage of the heart, and, therefore, the death of the patient, and that only subsequent stages of the inflammatory process, would, in general, be possible in partial affections."

and lead to its stoppage. On the other hand, in all of the cases examined, in which balls had wounded the pericardium, or even brushed against it, the physical signs of pericarditis were observed; and the *post-mortem* examinations revealed extensive exudations and effusions. The progress of these cases to their fatal termination was usually very rapid.[1]

From the solid exudations on the serous membranes, in wounds of the chest, we pass to the consideration of the gaseous and liquid effusions within the cavity of the thorax that often attend these injuries. The illustrious John Hunter pointed out this distinction in wounds of the chest compared with wounds of the two other great cavities,—the head and abdomen,—that the parts "are not under the same circumstances that other contained and containing parts are; for in every other case the contained and containing have the same degree of flexibility or proportion in size. The brain and skull have not the same flexibility, but they bear the same proportion in size. From this circumstance the lungs immediately collapse when either wounded themselves or when a wound is made into the chest and not allowed to heal by the first intention, and become by much too small for the cavity of the thorax, which space must be filled either with air or blood, or both; therefore adhesion cannot readily take place; but it very often happens that the lungs have previously adhered, which will frequently be an advantage."

Pneumothorax.—Air may be effused in the pleural cavity by a laceration of the lung from external contusion, or the rupture of air-vesicles, or of vomicæ in forced expiration, or by wound of the lung by a fractured rib, or, lastly and most commonly, by a wound penetrating the thoracic walls. It is generally associated with emphysema; but either condition may exist independently. Where there is an external wound, communicating with the cavity, the air is sucked in on inspiration and is forced out in expiration in an amount corresponding to the extent to which the lung expands. If the wound is small and oblique, or tortuous, the air finds its way among the meshes of connective tissue and emphysema is established. If the wound is large and communicates directly with the cavity, the lung, unless connected with the costal pleura by adhesions, soon collapses, and the space it occupied is filled with air. If there is no disturbance of the equilibrium of pressure of the external air and that admitted to the wounded side, the patient may breathe with comparative comfort with the sound lung; but if air is confined and condensed in the injured cavity, the sound lung is compressed, and distressing dyspnœa arises. The symptoms of pneumothorax, then, are dyspnœa, varying in degree, exaggerated resonance on percussion, absence of the respiratory murmur, amphoric respiration, if air inflates at all the collapsed lung. The intercostal spaces are effaced, the ribs elevated, and the injured side enlarged, if there is obstruction to the escape of the air. The chief subjective symptom is a sense of constriction at the base of the thorax.

It was the general experience during the war that traumatic pneumothorax very rarely assumed such a phase as to excite alarm. In the vast series of cases of chest

[1] The following articles, in addition to those cited on p. 534, may be consulted in reference to lesions of the heart and of its sac: COXE, J. R. *Some observations on Wounds of the Heart*, Am. Jour. Med. Sci., Vol. IV, p. 307, O. S., 1829; DAVIS, T., *Foreign Body in the Heart of a Boy*, Am., Jour. Med. Sci., Vol. XV, p. 205, O. S., 1834; *Wound of the Heart*, Am. Jour. Med. Sci., Vol. XXV, p. 225, O. S., 1839; RICHARDS, G. W., *Case of Wound of the Heart*, Boston Med. and Surg. Jour., Vol. XXXV, p. 336, 1847; TRUGIEN, JOHN W. H., *A Case of Wound of the Left Ventricle of the Heart; Patient survived five days; with remarks*, Am. Jour. Med. Sci., Vol. XX, p. 99, 1850; HOPKINS, R. C., *Gunshot Wound of the Heart; Death two weeks after the Accident*, Boston Med. and Surg. Jour., Vol. XLVII, p. 534, 1853; BALCH, G. B., *A Case of Gunshot Wound; In which a Leaden Ball remained in the Walls of the Heart for Twenty Years*, Boston Med. and Surg. Jour., Vol. LXIV, p. 515, 1861; ROBERTS, J. B., *A Man runs Sixty Yards and lives One Hour after being shot through both Lungs and the Right Auricle of the Heart*, Richmond and Louisville Med. Jour., Vol. XII, p. 607, 1871; PARADIS, M., *Observation de plaie pénétrante de poitrine avec lésion du péricarde*, in *Rec. de Mém. de Méd., de Chir. et de Pharm.*, Paris, 1836, T. XL, p. 325; TOURNEL, *Observation d'une plaie pénétrante de la poitrine, avec lésion du coeur, du poumon et de la branche phrénique gauche*, in *Rec. de Mém. de Méd., etc.*, Paris, 1836, T. XXXIX, p. 174.

wounds, this complication is noted as troublesome in less than half a dozen.[1] Yet there are many recorded instances[2] in which suffocation appeared imminent from the wounding of the mediastinum upon the sound lung. In such cases, it would be proper to dilate the wound, as Boyer, Dupuytren, and Guthrie recommend, or to practice thoracentesis if the wound has entirely closed, guarding against the readmission of air by attaching a pipe or bladder to the canula of the trocar. Saussier[3] has collected some valuable observations on this point.

Hydrothorax.—Serous effusion into the cavities of the pleura or pericardium is an occasional result of traumatic inflammation, and gives rise to most of the symptoms attending other liquid effusions, as dyspnœa, lividity of countenance, and the other phenomena attendant on imperfect aeration of the blood, with the physical signs of dulness on percussion, varying according to posture, and œgophony. In most cases of liquid effusion in the chest after wounds, the extravasation is more or less sanguinolent or purulent, and hence, in the clinical histories, few cases are reported under this head. When dyspnœa is urgent, paracentesis is the principal and reliable remedy.[4]

Hæmothorax.—Sanguineous extravasation within the pleural cavity may result from lesions of the heart or arteries proceeding from it or veins emptying in it, or from wounds of the mammaries and intercostals, or from wounds or lacerations of the substance of the lung. It occurs at the moment of the wound or several days afterward, when the clots obstructing the divided vessels fall. It may rapidly fill the sac or slowly accumulate, varying in extent and rapidity according to the number and size of the vessels wounded. When rapid and profuse the patient perishes promptly from asphyxia, and hence the cause of many deaths on the battle-field.[5] When less copious, and gradually extravasated, it gives rise to a series of phenomena which awaken the surgeon's utmost solicitude. Dyspnœa may become excessive; the breathing is frequent and labored; there is urgent anxiety and oppression and agitation; the patient seeks to sit upright (orthopnœa) or can tolerate only a dorsal decubitus, or can rest only on the wounded side, or throws himself from one posture to another, drawing up the thighs, elevating the head and shoulders, in short, fighting for breath. He has a sense of great constriction and weight at the base of the chest. There is dulness on percussion, and the respiratory murmur is absent on the wounded side to the level of the effusion; the intercostal spaces are protuberant, the ribs are separated and raised, the hypochondriac region is prominent, the injured side moves but little in respiration. These physical signs are modified when air is present in the cavity; then there is tympanitic resonance above, and below absolute dulness. The undulations of the fluid are felt by the patient in sudden movements. The blood gushes out of the wound in coughing or violent expiration. Superadded to these signs are those of copious hæmorrhage; the pulse becomes

[1] Abstracts of three of these cases are printed: Beck, p. 493; Lewis, p. 494; Eldridge, p. 520. Two recovered; the third was attended by emphysema and empyema, and the patient succumbed from exhaustion, not from suffocation.

[2] BOYER, *Traité des Mat. Chir.*, T. VII, p. 301; DUPUYTREN, *Lecons Orales*, T. VI, p. 331; GUTHRIE, *Comm.*, p. 439.

[3] SAUSSIER, *Recherches sur la Pneumothorax et les Maladies qui ta produisent*, Paris, 1841, p. 81. ITARD (*Dissertation sur les Collections gazenses qui se forment dans ta Poitrine*, Paris, 1801) specially studied this morbid phenomenon. LÆNNEC (*Traité de l'Auscultation médiate et des Maladies des Poumons et du Cœur*, Paris, 1831) treats of this subject with characteristic accuracy. Our immeasurable obligations to him and to AUENBRUGGER (*Inventum novum ex Percussione Thoracis humani*, Vienna, 1761) are never to be forgotten in considering the diagnosis of affections of the chest.

[4] DUVERNEY, *Sur l'Hydropisie de Poitrine*, in Mem. de l'Acad. des Sciences de Paris, 1703, p. 174; TEICHMAYER, H. F., *Diss. de Hydrope Pectoris*, Iéna, 1727; MORAND, *Sur une Hydropisie de Poitrine Guerie par Operation*, in Mém. de l'Acad. royale de chirurgie, 1759, T. II, p. 545; VOGEL, *Diss. de Hidrope pectoris*, Gottingue, 1763; GEHLER, *Diss. de Hydrothorace*, Leipzig, 1790; OTTO, *Diss. de Hydrothorace*, Francfort, a. v., 1800; MACLEAN, L., *An Inquiry into the Nature, Causes, and Cure of Hydrothorax*, Sudbury, 1810.

[5] Consult LIDELL on *Traumatic Hæmorrhage*, New York, 1870.

frequent, small, irregular; the face is pallid, the lips livid; the extremities cold; vertigo, singing in the ears, and other premonitions of syncope supervene. In the presence of this formidable array of symptoms, the surgeon's first thought is to stanch the bleeding. If it proceeds from the heart or greater vessels, he can do nothing; but in lesions of the subclavians and carotids, and of the innominata even, he will compress, and if the hæmorrhage can be temporarily controlled, he should apply ligatures. The mammaries and intercostals will be tied, if possible, and can always be controlled by compression. There remains for consideration only the bleeding from the lung tissue. The application of cold to the chest, the administration of cold acidulated drinks, of opium, of digitalis, and acetate of lead, perhaps, may be of some utility; but the important point, on which much difference of opinion existed during the war, is whether the wound or wounds shall be kept open or closed. Until a comparatively recent period, no doubt was entertained that the surest mode of arresting the hæmorrhage was to take blood from the arm. But, as will be seen farther on, this treatment is practically abandoned by American surgeons, and even those who still rely on venesection in inflammation, discountenance "preventive bleeding," or for hæmorrhage.[1] The results of opening the wound and giving free egress to the blood, and of closing it and allowing the blood to accumulate and to arrest the bleeding by its own pressure, regardless of the danger of asphyxia, have been discussed on page 523. Probably this perplexing problem admits of no invariable solution. Chassaignac[2] proposed, in these cases, to encourage collapse of the lung, and thus arrest its bleeding, by injecting air into the pleural cavity; but I do not know that this theoretical suggestion has ever been acted on. Larrey advised that the wound should be closed uniformly. I infer, from personal observation and from the reports, that the most judicious surgeons followed what may be called a mixed plan, which is described by M. Legouest,[3] whose excellent practical precepts I have always pleasure in quoting. In the first place, the wound should be closed, and cold, with ice if accessible, applied to the chest, and warm frictions and sinapisms over the extremities. One of two things must happen: Either the hæmorrhage ceases, the pulse rises, the warmth of surface is restored, the fearful array of symptoms gradually disappears; or else the bleeding goes on, and the effects of the effusion are more and more menacing. Then the wound must be reopened, and, if necessary for the evacuation of the blood, enlarged. If the escape of blood does not relieve the patient, but only weakens him, then the wound must be closed again, the revulsive applications to the general surface and the refrigerant local applications resumed; the patient laid on his injured side, his head and shoulders raised, his chest bandaged, if he can tolerate it, and thus persevering, opening and closing the wound, hoping to gain time, and to stave off the most pressing danger. When the immediate peril is passed, the effusion is to be dealt with, and this may be considered in treating of empyema. Though Hennen's observation, that where the third day has been safely got over great hopes may be held out, is true and very apposite in this connection, yet many examples of intermediary and secondary internal hæmorrhages were observed during the war, and the surgeon should be on his guard against such contingencies, especially when the position of the wound favors the supposition that an intercostal or internal mammary artery may have been wounded. The abstracts detailed

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[1] LEGOUEST, *Chirurgie d'Armée*, ed. 1872, p. 353. In this juncture, the majority still advise liberally repeated bleedings, says M. Legouest; but: "*Nous repoussons énergiquement les saignées*, comme étant plus nuisible qu' utile."

[2] CHASSAIGNAC, Thèse, 1835, p. 82.

[3] LEGOUEST, *Chirurgie d'Armée*, p. 353.

in this chapter, include twenty-one cases of hæmothorax, and among them are several in which the internal bleeding took place in the third week, and one, described on page 493, had fatal bleeding as late as the thirty-sixth day. Dr. Stromeyer[1] cites similar examples. John Hunter's[2] admirable account of hæmothorax is quoted by Mr. Poland in his article in Holmes's *System*, which is issued to medical officers. Dr. Chisolm,[3] in his excellent Manual, gives a graphic account of a case of primary hæmothorax, in which the extravasated blood was evacuated by partial inversion of the body.

When hæmothorax attends a shot perforation opening on the posterior part of the chest, the blood is likely to gain admission to the muscular interstices and to dissect its way downward, producing the lumbar ecchymosis so much commented on as a sign of penetrating wounds of the pleura. Hennen (*op. cit.*, p. 397) has observed this phenomenon as a sequence of wounds of the infrascapular vessels. On pages 575 and 576, I have given at length the views of Valentin and Larrey on this subject. Surgeons are now generally agreed that lumbar ecchymosis is of secondary importance as a sign of hæmothorax.[4]

The blood effused in the pleural cavity rapidly coagulates in the costo-diaphragmatic angle and lower part of the chest; and here it is that the cautions in regard to rash explorations of penetrating chest wounds, on which surgical teachers justly insist, are especially applicable; for a premature disturbance of the *caillot tutelaire* may reopen the mouths of the bleeding vessels. The presence of the blood commonly provokes an unwonted serous effusion in the pleura. A limited effusion may be absorbed, even when pneumothorax coexists. When the effusion is profuse, the blood is not absorbed, and a part remains liquid, with diffluent coagula floating in it. This liquid soon undergoes a purulent or putrid decomposition, which is indicated by a febrile reaction, with evening exacerbations, a dry and dusky skin, and frequently by œdema of the lower limbs.

The blood is usually unconfined in the pleural cavity, but it may be encysted by plastic exudations. Where it thus becomes circumscribed, it may be partially absorbed, or may give rise to an abscess, which, through a fortunate conjunction of circumstances, may make its exit externally or be discharged through the bronchial tubes.

Empyema.—Traumatic serous and bloody effusions in the chest, if not absorbed, decompose, and by the irritation they induce lead to the formation of pus. The same result is engendered by the presence of foreign bodies, and by necrosis of the bony case of the thorax. Empyema is, therefore, a somewhat frequent secondary complication of wounds of the chest. It is a subject that has been so fully illustrated by examples in the

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[1] STROMEYER, L. (*Erfahrungen über Schusswunden* im Jahre 1866, Hannover, 1867, S. 42): "Twice did it happen, that men, who had been considered cured, were allowed to go about, and then died from internal bleeding of the injured intercostal artery. The death of the one followed on the thirty-fifth, and of the other on the fiftieth day."

[2] HUNTER. *Works by Palmer*, Vol. III, p. 567, and *A Treatise on the Blood, Inflammation, and Gunshot Wounds;* by the late JOHN HUNTER, London, 1794, p. 553.

[3] Dr. CHISOLM observes (*A Manual of Military Surgery*, 1864, p. 325): "The effect of this escape of blood from the cavity of the chest was exemplified in the case of Major Wheat, who was shot through the chest at the first battle of Manassas, the ball entering in at one armpit and escaping from the other on a level with the nipple. Soon hæmorrhage caused great oppression and, finally, fainting. When he partially recovered his consciousness he found himself surrounded by his men, who, believing him dead, had stripped his body of every vestige of rank, so as to prevent recognition by the enemy. One of his men (a powerful sergeant), determined to save the body from indignities, had seized the major's arms at the wrists, and, with the assistance of a comrade, had slung the body over his back, drawing the arms of the supposed dead man over each shoulder, and in this position started off from the battle-field. Major Wheat was himself a powerful man, and his weight, in addition to his chest being drawn forcibly against the broad back of his sergeant, so increased the pressure upon his lungs as nearly to extinguish the flickering spark of remaining life, when he suddenly felt a gush of blood and air from both arm-pits, followed by such immediate relief that he found his breath returning, and when he reached the ambulance wagon he could stand up. Arriving at the hospital, he found that he had so far recovered, under this rough treatment, that he could walk with assistance. Quiet, with but little medication, soon completed the cure, and, in course of time, enabled the major to resume his command."

[4] SANSON, *Des Hémorrhagies traumatiques*, Paris, 1836, p. 260; LOUIS, *Mém. de l'Acad. de Chirurgie*, T. IV, p. 24; LEGOUEST (*op. cit.*, p. 358); ERICHSEN (*op. cit.*), Vol. I, p. 434; Dr. MACLEOD (*op. cit.*, p. 239) says it appears seldom. Dr. ASHHURST (*op. cit.*, p. 360) places it among the more trustworthy physical signs of hæmothorax; but on the authority of Valentin and Larrey. Callisen, Desgranges, and Chaussier give instances in which it was present without hæmothorax existing and absent where there was effusion of blood in the pleural cavity.

preceding pages, and discussed in all its varieties by authors,[1] that it is only necessary here to advert to its comparative frequency, and to the sources of information in regard to its treatment. In the subsection on thoracentesis, the practice of making free incisions for the evacuation of putrid or purulent effusions, as preferable, in traumatic cases, to paracentesis simply, and the use that was made during the war of drainage-tubes, injections, canulas, etc., has been described. I omitted, however, to record a plan of treatment proposed by Assistant Surgeon A. H. Smith, wishing to ascertain if it had been tested experimentally. As far as I can learn it has not been used practically by the inventor or by others:

In a letter to the Surgeon General, dated Hospital No. 13, Nashville, Tennessee, May 20th, 1863, Assistant Surgeon A. H. Smith, U. S. A., transmitted a mechanical contrivance designed for use in the treatment of penetrating wounds of the chest not involving the lung to such an extent as to cause danger from hæmorrhage, and having for its object the prevention of the entrance of air into the pleural cavity through the wound, while at the same time the air and other matters within the cavity are to be permitted to escape. The appliance, figured in the adjoining cut (Fig. 304), is thus commented upon by the writer:

"It is merely a valve to be applied to the chest over the wound, permitting the air, blood, etc., to pass out, but preventing the passage of air inward. The whole instrument is to be immersed in water, and when perfectly saturated applied to the chest, the centre corresponding to the wound. It is to be retained in position by a bandage wound around the body, having a hole in it for the piece of intestine, forming the valve, to pass through. By keeping the instrument constantly wet the leather will remain closely applied to the skin, while the proper action of the valve will, at the same time, be secured. If there be two openings in the chest, the valve is applied to the most dependent one, the other being closed. Even in a case in which the lung is already collapsed, I think the motion of the chest would, so to speak, *pump out* the air in the pleura, and, unless the lung be wounded in such a way as to open a free communication between the bronchial tubes and the pleural cavity, it must eventually expand again to its normal dimensions. And even if air entered the pleura through the lung as rapidly as it was pumped out through the external wound, there would still be a certain amount of circulation of air through the lung, which might in the end be of great advantage to the patient. On trial, it may be found best to cover the inner side of the leather with some adhesive material, and keep only the intestine wet. If found to answer the purpose, I would propose to have a number of these valves in each hospital knapsack, for use on the field."

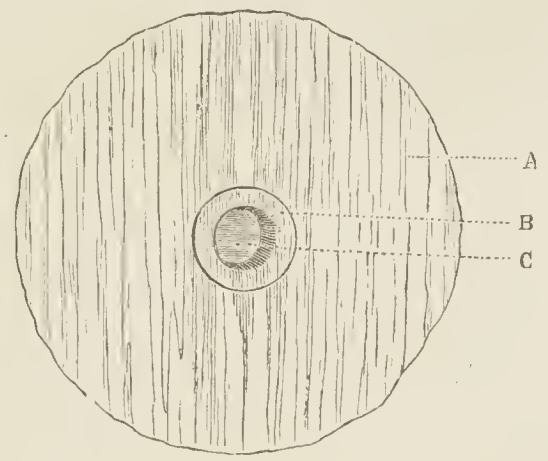

Fig. 304.—Dr. A. H. Smith's apparatus for effusions in the pleural cavity: A, leather disk; B, glass tube; C, valve. (Reduced one-half.) *Spec.* 4732, Sect. I, A. M. M.

Thoracentesis, and the other measures employed in empyema, have been discussed on page 573 *et seq.*

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[1] Fabricius, *De empyematis natura et curatione*, Rostock, 1626; Marquart Schlegel, *Dissertatio de empyemate*, Jena, 1639; Baldus, *Dissertatio de empyemate*, Leyden, 1646; Crampfer, *Dissertatio de empyemate*, Leyden, 1647; Wedel, G. W., *Dissertatio de empyemate*, Jena, 1686; Eckhout, J. von, *Dissertatio de empyemate*, Leyden, 1709; Bonetus, *Sepulchretum Anatomia Practica*, T. III, p. 348, Geneva, 1700; Ingram, *Practical Cases and Obs. in Surgery*, London, 1751; Fürstenau, *In Ephem. nat. curios.*, Vol. IX, p. 329, Obs. 78, 1752; Warner, *Philosophical Transactions*, Vol. XL, p. 1; Herrissant, *An in empyemate necessaria licet raro prospera paracentesis?* Paris, 1762; A. Monro, *State of the Facts concerning the first Proposal of performing the Paracentesis of the Thorax*, Edinb., 1770; Marchettis, *Sylloge Observat. Medico-chirurg. rar. obs.* 43, pp. 99, 102, 104, Naples, 1772; Bromfield, *Surg. Obs. and Cases*, Vol. I, p. 24, 1773; Nicolai, *De utilitate et necessitate paracenteseos thoracis*, Jenae, 1775; Hemmann, *Med. chir. Aufsätze*, Berlin, 1778; Flajani, *Collez. d'osservaz.*, Roma, 1802, oss. 47, p. 145; Gumprecht, *De pulmonum abscessu aperiendo*, Göttingen, 1796; Zang, *Darstellung blutiger heilkünstlerischer Operationen*, Wien, 1821, Band III, Th. I, S. 132; Pelletan, *Mém. sur les épanchemens dans la poitrine et l'opération de l'empyème*; in *Clin. Chir.*, T. III, p. 236, Paris, 1810; Albrecht, *De paracentesi pectoris*, Berolini, 1816; Jackson, S., *Case of Effusion into the Chest, in which Paracentesis was performed*, Phil. Jour. of Med. and Phys. Sci., 1825, Vol. X, p. 119; Faure, *Observation sur la ponction de la poitrine, pratique pour remédier aux divers cas d'épanchement pleuritique*, Gaz. Med. de Paris, 1836, p. 759; Sedillot, Ch., *De l'opération de l'empyème*, Thèse de Concours pour la Chair de Méd. opératoire, Paris, 1841; Roe, Hamilton, *On Paracentesis Thoracis as a Curative Measure in Empyema, etc.*, in *Lond. med.-ch. Transact.*, 1844, T. XXVII, p. 198; Trousseau, *Pleurésie, Paracentèse de la poitrine*, in *Clin. méd. de l'Hôtel-Dieu*, 1861, T. I, p. 619; Hitchcock, A., *Paracentesis Thoracis, Four times performed on the same Person, 37 lbs. 7 oz. of Fluid Discharged, Partial Recovery*, Boston Med. and Surg. Jour., Vol. 50, 1854, p. 69; Shattuck, *Empyema, Paracentesis, Spontaneous Opening, Death*, Boston Med. and Surg. Jour., Vol. 53, 1856, pp. 80 and 81; Bowditch, H., *On Paracentesis Thoracis*, Boston Med. and Surg. Jour., Vol. 56, 1857, p. 349; Warren, J. M. (Paracentesis Thoracis), *Surgical Observations, with Cases and Operations*, Chap. IV, p. 146; Gairdner, W. T., *Question of Thoracentesis and the mode of its performance*, Clin. Med., Edinburgh, 1862, p. 369; Boudin, J. C. M., *Études sur la Thoracentèse*, Paris, 1849; Landouzy, H., *De la respiration tubaire et amphorique dans la pleurésie et des indications à la Thoracentèse*, Paris, 1856; Velpeau, A. A., *Discussion sur la Thoracentèse*, Paris, 1865; Vernay, *Indications et Contre-Indications de la Thoracentèse*, Paris, 1864; Billroth, *Die Thoracentese*, Handbuch der Allgemeinen und Speciellen Chirurgie, B. III. Th. V, S. 149; Brill, J., *De empyemate internis præcipue remediis curando*, Diss., Marburgi, 1834; McDonnell, R. L., *Contributions to the Diagnosis of Empyema*, Dublin, 1844; Romburg, A., *Zur chirurgischen Therapie des Empyem*, Diss., Tübingen, 1869; Schletter, W. F., *Über die operative Behandlung des Empyems*, Leipzig, 1870.

Abscesses in the Lung.—Of true abscesses of the lung, or vomicæ, many examples have been related. These purulent formations were generally induced by the presence of foreign bodies in the lung. In rare instances, circumscribed abscesses broke and discharged into the bronchial tubes; more frequently they opened into the pleural cavity. Sometimes, when seated near the surface of the lung, they pointed externally; and, when the integument became discolored, the pleural surfaces were usually found to have formed adhesions, and the pus could be advantageously evacuated by a free incision. This form of abscess was distinguished from that resulting from caries and necrosis of the ribs, sternum, or vertebræ. The Museum possesses several specimens illustrating both varieties, but no drawings in which they are satisfactorily represented. Metastatic abscesses, or "foci," due as a rule to peripheral thrombosis, was one of the frequent epiphenomena of what was generally designated as pyæmia. But this complication was not a common result of wounds of the bony case of the thorax; and, in the few instances that were reported, the pathological specimens were not preserved, nor were the morbid appearances described with precision. I am forced, therefore, to borrow from a case of joint wound an illustration of the condition in question. In PLATE XIII, the external appearance of a metastatic focus in the lung is beautifully delineated. The drawing was made under the supervision of my predecessor, Surgeon J. H. Brinton, U. S. V., who also supplied the pathological notes. The clinical history was drawn up by Surgeon E. Bentley, U. S. V.:

CASE.—Corporal Jesse S———. Co. B, 4th Ohio Volunteers, 3d division, Second Corps, was admitted to the McVeigh Branch of the 3d division general hospital, Alexandria, Virginia, on December 5th, 1863, with a gunshot wound of the knee-joint, received near Mine Run, Virginia, November 27th. A conical ball struck the knee of the right leg just below the patella, on its inner and anterior aspect, fracturing the inner condyle and opening the joint, passed downward and forward, and was extracted about four inches from the point of entrance. At the time of the patient's admission to the Alexandria hospital, the joint and thigh were very much inflamed and discharged pus copiously, and the man was much prostrated and terribly anxious as to the result of his wound; but after being washed and fed, and otherwise cared for, he appeared much recruited. On December 8th, the operation of excision of the knee-joint was performed by Surgeon Edwin Bentley, U. S. V.; one inch of the femur, and about one inch and a half of the tibia bones being removed. The hæmorrhage was slight, but the condition of the tissues was not very satisfactory. The patient endured the operation well, and the reaction was good. On the 9th, the patient complained of severe pain on the right side of the chest over the lung, which continued for several days; no pain elsewhere. On the night of December 10th, he had a severe chill, which was followed by two still more severe attacks on the 11th. Stimulants were freely given, with raw eggs well beaten up and beef essence for diet. He continued to have chills till the night of the 13th, when he was seized with a very severe chill, from which he never rallied, and died on the morning of December 14th, 1863. The *post-mortem* examination, eighteen hours after death, showed no attempt at reparation, and there was considerable sloughing, while upon the inside of the thigh there were numbers of small abscesses. The heart and left lung were healthy, but the right lung was infiltrated with pus, and a single large abscess appeared upon the surface of the inferior lobe. There was no pus nor abscesses found in the liver, but it was very much softened. The stomach, kidney, and intestines were perfectly healthy. The preparations in the case were sent to the Curator of the Army Medical Museum, Surgeon J. H. Brinton, U. S. V., who made the following memorandum of the appearances in the limb: "Whole joint is one suppurating mass; pus extending up and down, far down under gastrocnemius, and up between the muscles of the thigh on the inside; a long abscess in the sheath of the vessels, extending up to the middle of the thigh. Small clot in femoral artery, three inches long and thin; none in femoral vein. Surrounding tissues of vessels in some places hardened, where pus had not reached. Lining membrane of femoral vein dirty gray and softened." Clot in saphena vein. Dr. Brinton added the following notes of the preparation of the lung, represented in PLATE XIII, received at the Museum December 15th, 1863: "Apparently a metastatic abscess very circumscribed. When examined, found to be a clot, in different degrees of softening, and red blood corpuscles in every state of change; but no pus. The greenish mass in each [condyle?] was complete circumscribed gangrene of the cancellated bony tissue (coinciding with Virchow's doctrine). See picture painted by M. STAUCH." The picture is very accurately copied in the chromo-lithograph opposite,[1] PLATE XIII.

There appears to be no reason why shot fractures of the ribs should not be followed by metastatic deposits in the lungs, the intercostal veins communicating with the pulmonary

[1] The preparation of the lung was preserved in the Army Medical Museum and numbered 1910 of the surgical series, but became so much decomposed after exposure by the draughtsman, that it was discarded, and the number 1910 was assigned to another specimen. There is a partly finished drawing of the femoral vessels by M. Stauch, which has been copied and elaborated by Mr. Fabre, with a view to its reproduction in chromo-lithography. The excised fragments of the knee-joint were not preserved. The adjacent portions of the diaphyses of the femur and tibia are numbered 1909, Sect. I, A. M. M., and are figured in the Catalogue, p. 336, FIG. 115. See, for a note of the case, the surgical report in Circular No. 6, S. G. O., 1865, p. 59.

METASTATIC FOCUS IN THE LUNG.

circulation by a short route. In twelve hundred fatal cases of penetrating chest wounds with fracture, pyæmia is noted as the cause of death in forty-nine, and some of these cases were attended by metastatic deposits in the lungs. The information contributed on this subject will be fully considered hereafter, in the discussion of thrombosis and embolism in general.[1]

By far the larger number of cases of intrathoracic abscesses reported were due to the presence of foreign bodies. Examples have been given of the discharge of such abscesses into the bronchial tubes, with the expulsion of the extraneous substances in coughing,[2] and cases also in which the foreign bodies either gained admission to the œsophagus, or passed through the diaphragm and entered the alimentary canal lower down and were voided at stool.[3] More commonly, these abscesses discharged through the thoracic walls.

Phthisical Tendencies.—Among the remote effects of wounds of the chest are violent inflammatory affections, ever subject to relapse, tedious exfoliations and suppurations, and a diseased condition which, as Hennen says, though it cannot be strictly called pulmonary consumption, agrees with it in many points, particularly in cough, emaciation, debility, and hectic. The pension examiners frequently report such cases as "consumption," and record the fatal event as due to phthisis. Invalids that have been wounded in the lung are almost invariably readily affected by atmospheric changes. Yet it has been claimed that a diseased state of the lungs has been ameliorated or even cured by a penetrating wound. Desgenettes[4] communicated a case of the sort to Larrey, and the latter[5] mentions a case of an officer with "well characterized phthisis," and in like manner Usher Parsons[6] entertained a similar belief, and Hennen,[7] though he never observed such an example himself, was reluctant to discredit the testimony on the subject. None of the cases or autopsies reported since the war appear to establish any relation for good or evil between wounds of the chest and true tubercular phthisis.[8]

[1] Consult Virchow, *Die Cellular-pathologie in ihrer Begründung auf physiologische und pathologische Gewebelehre*, Vierte Auflage, Berlin, 1871, S. 234; Rokitanski, *Lehrbuch der Pathologischen Anatomie*, Wien, 1861, Dritter Band, S. 76.

[2] See case of Colonel Collis, p. 584, and the less authenticated case of Miltenberger, p. 596. Dr. A. J. C. Skeene (*Med. and Surg. Reporter*, Phila., 1862, Vol. IX, p. 100) reports the case of Sergeant Allen R. Foote, Co. B, 3d Michigan Volunteers, as having received a penetrating wound of the right lung, and expectorating pieces of the ball eleven weeks after the injury. This circumstance is not noted in the reports of the Chesapeake and Long Island hospitals, but the patient is recorded in the latter as returned to duty October 1st, 1862. The sergeant was promoted to a lieutenancy in the 21st Michigan Volunteers, March 3d, 1864, and mustered out June 8th, 1865. A fourth case is printed in the *Boston Medical and Surgical Journal*, 1868, Vol. I, N. S., p. 339, of Private A. N. Rossiter, 49th Massachusetts Volunteers, said to have been wounded at Port Hudson, March 14th, 1863, and suffering subsequently from hæmoptysis, and coughing up, five years afterward, a flattened buckshot, after which "he was wholly relieved from his disagreeable symptoms." He is not a pensioner, and the hospital record gives the diagnosis "chronic diarrhœa," without indication of any wound.

[3] See cases of Stolpe, p. 515, and of Belt, p. 584.

[4] Desgenettes told Larrey that in the painting of the death of General Wolf, by Benjamin West, the figure supporting the fallen hero in its arms is the portrait of an officer who received a ball in his chest and was thus cured of well-marked phthisis.

[5] Larrey (*Mémoires de Chirurgie Militaire et Campagnes*, 1812, T. III, p. 376), on relating this statement of Desgenettes, records two examples of recovery from phthisis, following amputation of the shoulder-joint, as "proofs of the salutary effects of certain perturbing causes on the most hopeless diseases, and an explanation of phenomena that have astonished the greatest observers." One is the case of Lieutenant Colonel Hoevemeur, of the 2d Dutch Lancers, the other of a private lancer of the Guard, in whom the symptoms of pulmonary phthisis and those of the scrofulous cachexy, developed in the highest degree, entirely disappeared."

[6] Parsons. *New England Journal of Medicine and Surgery*, 1818, p. 209.

[7] Hennen (*Principles of Military Surgery*, 3d ed., 1829, p. 400): "An instance of this kind has never come under my notice; although I have very respectable living authority to say that a strong predisposition to phthisis was suspended in one case and spasmodic asthma remarkably relieved in another, by penetrating wounds of the thorax."

[8] I think the doctrine of the cure of pulmonary consumption through the agency of penetrating wounds of the chest should be regarded as a fable, perpetuated by respectful compliance with authority. It is said of Phalerus, by Pliny (*Naturæ Historiarum, Lib. VII, Cap. I, p.* 166), *deploratus à medicis vomicæ morbo*, the abscess was opened by a sword thrust, and the patient was cured. Guthrie has grouped Phalerus, on what authority he does not state, with Jason and Prometheus, and says that being expected to die of abscesses of the lungs, they went into battle for the purpose of getting killed; but being only run through the body, the purulent matter escaped, and they all recovered (Guthrie). Other commentators hold that the Scythian vulture performed paracentesis in the case of Prometheus. Dr. Macleod says (*Notes, etc.*, p. 256): "Veritable phthisis, has, however, as is well known, been cured by the rough medication of a gunshot wound." The reader will find some interesting observations on this subject in Dr. Usher Parsons's *Cases of Gunshot Wounds through the Thorax, with Remarks*, printed in the seventh volume of the New England Journal of Medicine and Surgery, 1818, page 209. In relating the case of Captain Charles Gordon, wounded through the chest in a duel, Dr. Parsons says that he had been "subject to cough, and was threatened with a pulmonary affection, all which the bleeding from the wound appeared to remove. A similar instance is related to me by Dr. Wheaton, of Providence, in a case where a musket ball passed through the right lung of a young man laboring under phthisis pulmonalis. The hæmorrhage was very profuse, but was followed by a speedy recovery both from the wound and phthisical affection. *Quere.* Do not these facts speak in favor of venesection as a remedy in consumption as recommended by Dr. Gallup?"

Thoracic Fistulæ.—Fistulous openings in the walls of the chest were occasionally observed among the troublesome consequences of penetrating wounds of the chest. Of twelve hundred and twenty-three invalids on the pension roll of the United States, for the results of this form of injury, twenty-two are reported with thoracic fistulæ. This condition is likely to arise when an abscess or empyema having discharged or been punctured through the chest wall, the pleura fails to adhere near the orifice, and forms a pouch in which the pus accumulates. Some examples have been given in the preceding pages. (Cases of Young, p. 479, Kuhn, p. 480, Brownlee, p. 488, Henry, p. 490, Tomlinson, p. 502, and Bowman, p. 577.) The following is an instance in which the reducing measures employed did not avert a fatal termination:

CASE.—Private James Parker, Co. G, 16th New York, aged 24 years, was wounded at Gaines's Hill, Virginia, June 27th, 1862; the ball entered between the eighth and ninth ribs, seven inches from the spine on the right side, and emerged below the head of the tenth rib, one inch from the spine on the same side; the ninth rib was fractured about midway in its course. He was treated in the field and transferred to Ascension Hospital, Washington, on July 4th. On admission, there was no emphysema or other sign of injury to the pleura or lung. Some small spiculæ of bone, which had worked to the surface posteriorly, were removed, and the chest nearly encircled by adhesive straps. Antimonial and saline mixtures were administered, and low diet ordered. August 1st: Some friction sound at point of fracture, but no effusion and no pneumonia. Tincture of veratrum viride was ordered, and, as the pulse was 105, calomel was administered, but a better diet was given as his strength was failing. A pulmonary fistula was established on August 2d. Air issued, with a bubbling sound, anteriorly and posteriorly, on coughing or sneezing. By intercepting the air by pressure between the points of wounding and the point of fracture, the fistula and fracture were found to be identical in position. There was no effusion, no pneumonia, no collapse of the lung, and no emphysema, on account, it was supposed, of the free exit afforded by the wound to the air, and it was, therefore, judged that the pleura was adherent about the point of fistula. His weakness increasing, punch, iron, and quinine were ordered freely. The bandage was still continued. August 4th: The sputum is now tinged with blood; pulse, 105; strength poor; fistula still exists. A slight friction sound was still perceptible, but localized at the fistula. Vomiting and diarrhœa have set in. Anodynes and astringents were given, and the nutritious diet continued, with a diaphoretic for the slight pneumonia. Over the subcutaneous fistulous point a compress was applied, and bandaged firmly in hopes of its closing. August 7th: Pneumonic sputum disappeared. Anterior orifice closed entirely; posterior one cicatrizing; fistula entirely gone. There is now no dulness, no effusion, though the friction sound continues. No cough; pulse, 95. Compress removed. Bandage and nutritious diet continued. Diarrhœa gone. August 15th: The pleurisy is marked, the fracture uniting. There is no effusion or pneumonia, and the patient is gaining strength decidedly. The fistula has not returned, and the posterior orifice has almost healed. His diet is less nourishing, and the antimonial and saline preparations, with morphia and mercury recommended. He was discharged from service on September 20th, 1862. Acting Assistant Surgeon W. W. Keen, jr., reports the case. Under date of October 17th, 1863, Pension Examiner Benjamin J. Moses, reports: "The ball entered the anterior and lower part of the scapula and passed out close to the spine, injuring the right lung and producing the various symptoms of consumption under which he appears to be laboring at present." He died on January 10th, 1864.

Professor Gross (*op. cit.*, Vol. II, p. 449) indicates the proper remedy in these cases. A counter-opening must be made into the most depending portion of the sac and ready drainage ensured by a canula or elastic tube. Weak astringent and detergent injections are also indicated in these cases. Sometimes the fistula communicates with the bronchial tubes, and then much caution is requisite in the employment of injections. Dr. Hannover, who has paid much attention to the remote effects of gunshot wounds, refers to cases of thoracic fistula among the Danish invalids.[1] M. Chassaignac treats of the subject with his usual minuteness.[2] Dr. Neudörfer[3] dwells on the necessity of frequent renovation of the air in the cavities of thoracic abscesses. The detection and removal of the irritating cause to which the persistence of the fistula is due, are the objects the surgeon will ever have in view.

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[1] HANNOVER (*Die Dänischen Invaliden aus dem Kriege* 1864, *in ärztlicher Beziehung*, Berlin, 1870, S. 17) observes: "Where life is preserved after gunshot wounds of the chest, the degree of invalidity is generally insignificant, and the capacity for labor is little diminished; in several cases, even where the cavity of the chest was penetrated, the ribs fractured, and the lung injured, a complete cure followed in the course of several years, while in others a fatal result ensued, or the patient suffered from a fistula and its consequent mischief. In a yet living patient, the connection between the fistula and the lungs is so large that injections into the fistula pass through the windpipe into the mouth."

[2] CHASSAIGNAC. *Traité pratique de la Suppuration et du Drainage Chirurgicale*, Paris, 1859, T. II, p. 347.

[3] NEUDÖRFER (*Handbuch der Kriegschirurgie*, Leipsig, 1867, Zweite Hälfte, S. 655) observes: "I wish to lay especial stress upon the fact, that the air in the suppurating pleural cavity be constantly renewed and never be closed in, as only then the circumstances are the same as a freely opened abscess. * * * It is a fact that, in the suppurating pleural cavity, confined air is pernicious; it is this that changes healthy pus into putrid matter."

Collapse of the Lung.—Collapse of the lung, partial or complete, unless the organ is already adherent to the thoracic walls, sooner or later follows upon an opening, larger than the glottis, being made into the pleural cavity.[1] This phenomena takes place whether the lung is wounded or not, but more rapidly when it is extensively wounded. The falling away of the lung is not a uniform consequence of a penetrating wound of the chest. If the wound is small, or if it is at a distance from the free margin of either lobe, the expanded lung remains in contact with the costal pleura, and often remains long enough for adventitious adhesions to form. When the lung collapses, unless compressed by liquid effusion, it generally is partially expanded by air passing from the sound lung into the trachea, and thence, on closure of the glottis, into the bronchi of the wounded side. It is inflated in expiration and not in inspiration.

The experimental enquiries on this subject, by Hales in his *Statical Enquiries*, by Hewson, Hoadley, Houston, Van Swieten, Cruveilhier, Halliday, Graefe, and Dr. Fraser,[2] must be consulted for anything approaching a full discussion of this interesting subject. In connection with them the following account of recent experiments will be valued:

Assistant Surgeon A. H. Smith, in a letter dated Fort Wadsworth, New York, October 15th, 1867, details some experiments, which were undertaken with a view to determine why certain cases of penetrating wounds of the chest result in collapse of the lung, while in other cases apparently similar the lung remains distended. The lungs were not wounded in these experiments:

"The object of the first experiment was to ascertain the manner in which the lung collapses when air is admitted into the pleural cavity. An animal was killed by a blow upon the head, the trachea exposed and secured by a ligature, and the lungs brought into view by raising the sternum. On cutting the ligature it was observed that the lungs did not recede from the thoracic wall, but withdrew themselves from the sternum toward the spinal column, keeping their external surface closely applied to the inner surface of the ribs. This was evidently due to the pressure of the atmosphere, which prevented a separation of the two smooth, moist pleural surfaces, while it permitted one to slide upon the other, as may be observed when two moistened glass plates are pressed together. This observation led to the inquiry: what would be the result if the chest were opened at a point away from the free margin of the lung? It was anticipated that, in this case, the gliding motion above described would not take place, as the air would not have access to that portion of the thoracic cavity which must be the first left vacant by the retraction of the lung, viz: that part occupied by its free margin. But it seemed probable that the lung tissue, contracting at the point where the wound had left a vacancy in the thoracic wall, would draw with it a circle of the lung-substance immediately surrounding and then form a cup-like depression, the circumference of which would go on increasing (the pleura pulmonalis peeling, as it were, from the pleura costalis) until the entire lung had collapsed. Experiments, however, afforded a different result, while they completely justified the anticipation with regard to the non-retraction of the lung. An opening was made in one of the intercostal spaces of a recently killed animal, care being taken to select a point as distant as possible from the margin of the lung and from the division between the lobes. The pleura costalis being carefully opened, the lung was found to remain closely applied to the wall of the chest, showing no disposition to collapse, except that there was a slight depression, the margin of which corresponded exactly with the margin of the wound in the pleura costalis. That the depression did not extend farther seemed to depend upon the fact that it could not exceed a certain depth without putting upon the stretch the fibres of lung tissue radiating (see FIGURE 305) from its apex to the surface of the lung at a distance from the wound, and where the atmospheric adhesion to the chest was unimpaired. The wound before described, which was about midway between the sternum and the spine, remaining open and the lung plainly visible through it, a second opening was made in the same intercostal space, at the edge of the sternum. Immediately there was a sound of air rushing into the thorax, and the lung at once began the gliding motion before mentioned, the specks of pigment in its surface passing rapidly in review before the first opening, where the lung could be seen to retain its contact with the ribs until at last its free border passed the wound and disappeared, when this opening, for the first time, admitted air into the pleural cavity. By inflating the lung through the trachea, the experiment was repeated again and again with the same result, the lung remaining distended

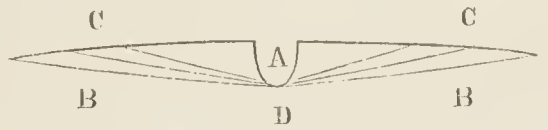

FIG. 305.—A—Depression in lung opposite wound. B—Lung tissue taking its fixed point at C and opposing farther depression in the direction of D.

[1] This has been denied by speculative writers, and indeed it would be difficult to name any point connected with the mechanism of respiration that has not been called in question. BENJAMIN BELL (*System of Surgery*, 1804, Vol. I, p. 207) taught that the air escaped from a wound in the chest during inspiration, and many observers have reported that they have seen pneumatoceles diminish in volume in expiration. Mr. ERICHSEN says that collapse of the lung "has been more frequently spoken about than seen," which is a worthy exordium to the conclusion that "when it does occur in the early stage it is, I believe, owing to compression of the air sucked into the cavity of the pleura *by* pneumothorax."

[2] HEWSON, *Medical Observations and Enquiries*, 1776, Vol. III, p. 391; HOUSTON, *Philosophical Transactions*, Vol. IX, p. 138; HOADLEY, *Three Gulstonian Lectures on the Organs of Respiration*, 1737; VAN SWIETEN, *Philosophical Transactions*, Vol. IX, p. 139; CRUVEILHIER, *Anat. Path.* Liv. XXI; GRAEFE, *London Lancet*, May, 1828; HALLIDAY, *Observations on Emphysema*, 1807; FRASER, *op. cit.*, p. 29.

whenever the anterior wound was kept covered with the finger, but retracting the instant the finger was removed. These observations have since been repeated a sufficient number of times to leave no doubt, that *in the dead subject* the lung will collapse if the chest be punctured at or very near the free margin of one of the lobes, while it will remain distended if the puncture be made elsewhere. In the living animal the results obtained were the same, except that the lung never collapsed *entirely* when one side only of the chest was opened. A portion of the air in the lung on the sound side evidently passed into the other lung with each expiration, and thus kept it partially expanded. The degree of this expansion depended upon the character of the respiration. Thus, when the animal was fully under the influence of an anæsthetic and the respiration not affected by the will, the collapse was more nearly complete, while the moment consciousness began to return and an attempt was made to use the voice, the inflation of the lung with each expiration became very considerable, and when a loud shrill cry was uttered; or, in other words, when the aperture of the glottis was narrowed, and, at the same time, a forcible expiratory effort was made, the lung completely filled out the cavity of the chest, and the edge of one of the lobes was thrust out through the wound. This suggests a method of reinflating the collapsed lung, if thought desirable, in similar cases in the human subject. Nothing more would be necessary than to instruct the patient to take as full an inspiration as possible, the wound being covered with the hand, and then, uncovering the wound and closing the mouth and nostrils, to make a forcible expiratory effort. The collapsed lung would then be partially inflated, and by repeating the manœuvre a sufficient number of times its complete distension would be effected. Several of the above experiments were made in the presence of Dr. R. F. Weir, late Assistant Surgeon U. S. A., and with his assistance." On May 27th, 1869, Dr. Smith communicated the following report: "Experiment 1st, March 10th, 1868.—A bullock was killed by cutting the throat; ten minutes afterward, a stopcock was tied firmly in the trachea and closed. An opening was then made in the eighth intercostal space, on the left side, nine inches from the spinal column; air immediately entered the chest, and the ribs visibly expanded; as the trachea was completely closed, it would seem that the retractile force of the lung tissue in the last moments of life overcame the elasticity of the ribs, resulting in a diminution of the cavity of the chest. On passing the finger into the wound, it came directly upon the margin of one of the pulmonary lobes. Experiment 2d.—An opening was made in the seventh intercostal space, on the right side of the same animal, at the same distance from the spine. The result was precisely the same as in experiment 1st. The wound was found to be opposite to the margin of one of the lobes of the lung. On opening the stopcock, both lungs immediately collapsed. Experiment 3d.—One of the smaller lobes was detached from the remainder of the lung, and its costal surface applied to the inner surface of the chest. Seizing it in the middle, between the thumb and finger, and making traction, a considerable resistance was experienced, and the margin drew in toward the centre an inch or more before any separation between the two serous surfaces took place. At the same time, a gliding motion from side to side was easily produced. Experiment 4th, March 16th, 1868.—A large dog was fully chloroformed and a small opening made in about the middle of the ninth intercostal space on the left side. The opening came directly upon the edge of a pulmonary lobe; air entered immediately through the wound and the lung collapsed. The opening was then enlarged to the extent of about three inches, when the lung could be seen nearly collapsed, but apparently inflating a little with each expiration. The animal having regained partial consciousness, and the wound being closed by drawing the skin over it, a faint vocal sound was audible with each expiration. Uncovering the wound, this sound immediately ceased, but returned each time the opening was closed. A knife being passed through the integument with the intention of dividing the medulla oblongata, loud cries were uttered; the lung was distended, and a portion of it was thrust through the wound. Experiment 5th.—The animal having been killed by a blow upon the head, the trachea was opened and a tube inserted, through which the lung was fully inflated. The tube was then closed. An opening one-third of an inch in length was made on the right side, between the ninth and tenth ribs, one-third of their length from the spine; a continuous surface of lung was exposed; on opening the tube, the chest, which was over distended, contracted, the lung retaining its contact with the chest, but gliding upwards until the margin of a lobe came opposite to the opening, when immediate collapse took place. The lung was again distended and an opening made one space higher up, and the first wound covered; no marginal line was visible on the lung, yet collapse followed when the tube was opened. On examination, it was found that the lung had not been fully distended; its complete expansion being prevented by air imprisoned in the deeper portion of the cavity of the chest; an elastic catheter was therefore introduced into this space through the wound, thus affording means for the air to escape. The lung was now inflated, the catheter withdrawn, and the little tube in the trachea opened, the first opening in the chest being covered. No collapse took place; the same was the result when an opening was made in the seventh intercostal space. Experiment 6th.—Raised the sternum, inflated the lungs, and allowed the air to escape; the left lung retracted, keeping its outer surface in contact with the inner surface of the chest. The right lung collapsed irregularly. Experiments 4, 5, 6 were performed in the presence of Dr. S. Traver, Assistant Surgeon U. S. Navy. Experiment 7th, March 24th, 1868.—On the right side of the body of a man who died of acute diarrhœa, a small opening was made two and a half inches below and external to the nipple; air immediately entered and the lung collapsed. It was found that the liver was greatly enlarged, and that the lung did not extend below the opening. Experiment 8th.—An opening was made on the left side of the same subject two and a half inches above and external to the nipple; a continuous surface of lung was exposed to the extent of a circle half an inch in diameter. No collapse took place; but there was a cup-like depression of the exposed portion of the lung; on passing the handle of a scalpel into the wound and lifting up its margin, air entered and the lung subsided. I regret that this subject did not attract my attention until after the close of the war, which would have afforded abundant opportunities for testing the correctness of my views. One case, however, of which I retain a very distinct recollection, has an important bearing upon this question. A private of the 43d New York Volunteers was wounded by a musket ball while on picket before Yorktown, about April 20th, 1862; the ball entered in the second intercostal space on the right side, directly above the nipple, and emerged through the centre of the scapula, appearing not to have injured the ribs either at its entrance or exit. There was no collapse of the lung, as I remember tracing, day by day, the physical signs of the pneumonia that followed. The recovery was remarkably rapid, and the last of June I met the patient walking in the streets of New York, apparently perfectly well. The situation of the wound in this case was central in regard to the upper lobe of the lung, which goes to support my view; it is possible, however, that there may have been previously existing pleuritic adhesion, but the likelihood of this is diminished by the fact that the patient was not more than 17 or 18 years of age." * *

Contraction of the Chest.—A deformation of the thoracic walls is one of the remote results of severe injuries of the thorax. After the absorption or evacuation of extensive pleuritic effusions, if the lung remains unexpanded, the side of the chest falls in to accommodate itself to the crippled lung, and there is a corresponding incurvation of the spinal column. This flattening and deformity is noted as extensive in about twenty-five cases of pensioners who recovered after large extravasations in the pleural cavity. More limited depressions are observed in a number of pensioners who have suffered from necrosis and loss of substance of the ribs, and thoracic fistulæ.[1] Mechanical apparatus have not been found of utility in these cases. In a few instances, with the partial resumption of its functions by the lung, the deformity of the chest has been in a great measure removed. It was in cases of this class that Bromfield[2] advised the use of wind instruments and pneumatic apparatus to promote the inflation of the injured lung, propositions which John Bell ridiculed in his lively style.

Secondary Emphysema and Pneumothorax.—These affections occurred in rare instances as secondary complications, very obscure and perplexing in their symptoms and progress. A veteran at the Soldier's Home, whose left arm had been disarticulated at the shoulder, received a blow from the fist, or from a blunt weapon, over the right nipple. Surgeon Laub found no fracture of the ribs; but there was an unnatural resonance on percussion, cough, and a purulent expectoration, and, after a few days, a crackling tumor appeared and spread over the great part of the pectoral muscle. After a few weeks there was evidently a communication between this tumor and the pleural cavity, and metallic tinkling and the signs on percussion, indicated the presence of air and of pus in that cavity. The arm became swollen and emphysematous, and pus pointed below the insertion of the coraco-brachialis, and, notwithstanding a free incision here, dissected its way down the forearm. Soon after, there was profuse hæmorrhage from the incision of the abscess, and a tourniquet was made to compress the brachial artery. The hæmorrhage recurring whenever pressure was removed, and the entire arm and forearm being infiltrated with pus and air, the bleeding point was exposed by a very free incision along the inner border of the biceps, and ligatures were placed above and below upon the bleeding vessel, which was the collateralis magna, enlarged to nearly the size of the brachial. The incision was then extended upward through the skin and fascia nearly into the axilla, and down the forearm to the annular ligament. Pus and gas were freely discharged. The immense wound, in a few days, assumed a healthy appearance, the ligatures came away in a fortnight, and the arm recovered without much stiffness. Meanwhile the tumor in the pectoral region subsided, the cough and purulent expectoration gradually disappeared, the normal respiratory murmur was restored, and in a few months, under a sustaining regimen, with cod-liver oil, porter, and other restoratives, the man regained his accustomed health. Hennen details a curious case of secondary emphysema at page 385 of his masterly treatise, and one of the cases which Guthrie observed after Waterloo, which was called a hernia of the lung, would appear, from the brief description, to have presented rather the characters of secondary emphysema. In the latter part of the last century and at the commencement of the present, when the researches of physicists on pneumatics were exciting great popular interest, in cases of secondary pneumothorax, surgeons paid great

[1] Professor GROSS remarks (*A System of Surgery*, 1862, Vol. II, p. 449), of fistulous thoracic abscesses: "The cure of these affections, which is generally followed by a remarkable retrocession of the walls of the chest, is sometimes promoted by weak astringent and detergent injections."

[2] BROMFIELD, *Chirurgical Observations and Cases*, London, 1773, Vol. II, p. 93; JOHN BELL, *Discourses on Wounds*, Part II. p. 19.

attention to the removal of the air by suction, and various adaptations of the air-pump were proposed for this object. Abernethy treats of this subject, with his accustomed acumen, in the second volume of his *Surgical Observations* (p. 171).

Wounds of the Œsophagus, Thoracic Duct, Nerves, and Diaphragm.—On wounds of the pectoral portion of the gullet, of the chyliferous duct, of the par vagum, and other contents of the posterior mediastinum, little information was acquired by any of the observations made during the war. Benjamin Bell[1] has given a learned description of the symptoms that should attend lesions of the canal of Pecquet and its tributary lymphatics; but it is drawn partly from Mangetus, and more largely from the imagination. Of wounds of the nerves our information was greatly extended by the careful investigations of Drs. Mitchell, Keen, and Morehouse; but, with the exception of lesions implicating the axillary plexus, their researches embraced few cases attended by wounds of the chest. On wounds of the diaphragm much interesting matter was contributed, which must be reserved for consideration under the head of wounds and injuries of the abdomen.

Wounds of Both Lungs.—I have adduced, at page 497 *et seq.*, a number of examples of recovery after shot wounds of both lungs, and have, perhaps, done injustice to the reporters, in expressing great skepticism as to the accuracy of diagnosis in such instances. I am not ignorant that Hemmann, Schlichting, Ravaton, Van Swieten, Forestus, and Schmucker,[2] give many examples of both sides of the chest being opened without the accident proving fatal; but I know of no modern instance in which the cicatrix of a ball has been traced through the substance of both lungs at a remote period from the reception of the injury.

Erysipelas and Gangrene.—These complications were very rare in the chest wounds treated, except in a few overcrowded hospitals, where almost every solution of continuity became the seat of unhealthy action. In the eight thousand seven hundred and fifteen cases of penetrating wounds of the chest, erysipelas is noted in seventeen cases, of which nine proved fatal; and gangrene in sixty-eight cases, with fifty deaths. In the eleven thousand eight hundred and ninety-two non-penetrating injuries of the chest, erysipelas supervened in one fatal case, and gangrene in twenty-six cases, of which eleven terminated fatally (see page 472). Thus it appears that these complications, though rare, were very fatal. The three following abstracts are gleaned from the scanty notes of cases of gangrene in wounds of the chest reported in detail:

CASE.—Corporal Charles H. Freas, Co. H, 84th Pennsylvania Volunteers, was wounded in the left side, at Chancellorsville, Virginia, May 3d, 1863, by a conoidal ball. He was conveyed by hospital steamer State of Maine to Annapolis, Maryland, where he was admitted to the 1st Division Hospital on May 17th. The missile entered immediately under the head of clavicle, passed through and emerged at superior angle of scapula. On May 21st, gangrene set in at orifice of exit, and on May 22d the wound was two inches in diameter and covered with a thin layer of slough; on June 27th, slight signs of granulations appeared and from this time he rapidly improved, and on July 15th was nearly well. The treatment consisted of administration of stimulants and application of solution of creosote and vinegar, and nitric acid around the edges of the wound. In October he was transferred to Philadelphia, admitted to Satterlee Hospital October 27th, and returned to duty May 3d, 1864. He was discharged the service August 25th, 1865. The case is reported by Acting Assistant Surgeon L. Smith. Pension Examiner R. S. Simington, Philadelphia, reports, February 13th, 1867: "Gunshot wound of left shoulder, causing contraction of muscles; he is unable to raise his arm to use it. Disability one-half and probably permanent."

CASE.—Private Reuben V. Hilands, Co. C, 105th Ohio Volunteers, aged 41 years, received a gunshot penetrating wound of lung at Perryville, Kentucky, October 8th, 1862. He was treated in hospital at Perryville during the same month, and, on January 14th, 1863, was admitted to hospital at Camp Chase, Ohio, where he was discharged on that date. The ball passed

[1] BELL, B. *Of Wounds of the Thorax*, Chapter III, of the 7th edition of his *System of Surgery*, Edinburgh, 1801.

[2] HEMMANN, *Med.-chir. Aufsätze*, Berlin, 1778; SCHLICHTING, *Traumatologia nova antiqua*, Amsterdam, 1748; RAVATON, *Chirurgie d'Armée, ou Traité des Plaies d'armes à feu* and *Prâtique Moderne de la Chirurgie*, Paris, 1776; VAN SWIETEN, *Commentaria* in *Hermanni Boerhaave Aphorismus*, Paris, 1755; FORESTUS, *Observationum Chirurgicarum Op. Omn.*, Francof., 1610; SCHMUCKER, *Chirurgische Wahrnehmungen*, Berlin, 1774.

through the left scapula and upper portion of lung, emerged at the base of neck and reëntered, immediately passing back of trachea, and, removing three upper molar teeth on the right side, came out in front of the lower point of the ear. The apparently erratic course of the bullet may be accounted for by the position of soldier when wounded. He was retreating, and stooped with his head turned to the left looking at his gun, which he was loading when struck. Blood issued from the wound of the neck at every expiration, and he could not breathe without great difficulty, except when the wound in neck was closed. March 6th, 1866, Pension Examining Surgeon C. Byles, who reports the case, states that the left lung is dull on percussion and silent on auscultation; the wound in neck occasioned the total loss of his voice, which was recently instantaneously restored by an attack of vomiting; his nervous system suffers much, whole left side weak and paralyzed. Pension Examiner J. P. Hosack, of Mercer, Pennsylvania, reports, January 18th, 1870, that the weakness of lung, shortness of breath, stiffness of shoulder, weakness of arm, and painful aphonia, is equivalent to total disability.

CASE.—Private *John W. Elkins*, Co. G, 12th Louisiana Regiment, aged 19 years, was wounded at Nashville, Tennessee, December 15th, 1864, by a conoidal ball, which penetrated the right lung. He was received into Cumberland Hospital, Nashville, on December 17th, and thence transferred to Hospital No. 1, Nashville, on January 4th, 1865. The wound became gangrenous, and he died March 10th, 1865.

Gangrene of the walls of the track of a musket ball through the lower lobe of right lung is observed in Specimen 3348 of the Surgical Section of the Museum.[1]

Tetanus.—The rarity of tetanus as a complication of chest wounds, an observation for which we are indebted to Dr. Fraser,[2] is undeniable, and is interesting in connection with diagnosis, as indicating the lesser implication of the sympathetic nervous system in lung wounds, than in wounds of the abdominal cavity. There were seventeen instances of tetanus among the eight thousand seven hundred and fifteen cases of penetrating wounds of the chest.

DIAGNOSIS AND PROGNOSIS.—Dr. John Jones,[3] our Revolutionary authority in military surgery, said, "penetrating wounds of the thorax are in general pretty easily distinguished from the peculiar symptoms that attend them. The most remarkable of these is the passage of the air through the wound in respiration and the expectoration of frothy blood from the lungs when they are wounded." To these accepted signs, emphysema, dyspnœa, nervous anxiety, collapse of the lung, and, later, pleurisy and pneumonia are commonly added by modern authors. A cursory examination will show that none of these symptoms singly merits implicit reliance, though their concurrence affords strong presumptive proof of wound of the lung.

Tromatopnœa.—The passage of air through the external wound was once regarded as conclusive evidence of wound of the lung.[4] This is disproved by observation and experiment. Air will pass freely in and out through a small opening in the pleural cavity

1 *Spec.* 3348, SECT. I, A. M. M. "A preparation of the lower portion of the right lung, perforated by a conoidal ball which entered between the sixth and seventh ribs, and is gangrenous. Corporal J. P——, Co. A, 69th Ohio, Petersburg, 26th June. Admitted to hospital at Alexandria, July 4th; died July 12th, 1864."

2 FRASER. *Treatise upon Penetrating Wounds of the Chest*, p. 20. The proportion of cases of tetanus given in the text, one in five hundred and twelve cases, does not appear very small. But there were only six cases of tetanus among those wounded superficially in the chest. The comparison should therefore be instituted between the twenty three cases of tetanus and the total of twenty thousand six hundred and seven chest wounds, or one in eight hundred and ninety-six cases. In Paris, in 1830, out of three hundred and ninety gunshot wounds, there was but a single case of tetanus, but that one occurred in a penetrating wound of the chest (Menière). The reports of the Indian Mutiny refer to one case of tetanus in the small series of chest wounds (Williamson). Of twenty-nine cases of tetanus in the Crimea, but one supervened in chest wounds, a case of trismus in a French soldier (Fraser). Larrey does not mention a case. In the Danish War of 1849-50, in nine hundred and twelve wounded, no case of tetanus occurred (Schytz). Sir Gilbert Blane (*Observations on the Diseases of Seamen*, 3d ed., London, 1799, p. 555) states that in a naval action, in April, 1752, of eighty-eight wounded, sixteen had tetanus. Dr. B. BECK (*Allgemeine Militär-ärztliche Zeitung*, No. 37, Sept. 15th, 1872) says that among 7,182 wounded of the Fourteenth Corps (Bavarians under General Werder), tetanus occurred in only forty-five cases.

3 *Plain, Concise, Practical Remarks, on the Treatment of Wounds and Fractures;* To which is added an appendix on Camp and Military Hospitals; Principally designed for the Use of Young Military and Naval Surgeons in North America; By JOHN JONES, M. D., Professor of Surgery in King's College, New York; Philadelphia, Third Street; printed and sold by Robert Bell. 8vo. 1776.

4 Hence, the "waste of time and wax-tapers in ascertaining the exit of air through the passage" to which Hennen (3d ed. p. 375) alludes. Dr. J. Thomson remarks (*Report of Observations made in the British Military Hospitals in Belgium after the Battle of Waterloo*, Edinburgh, 1816, p. 80) that "it is often difficult to say, in wounds of the chest, whether they penetrate into the sacs of the pleura; but all doubts with regard to this point are removed the moment we observe air coming out of the wound upon coughing." Of nine fatal cases reported by Dr. Fraser (*op. cit.* p. 86) of penetrating chest wounds in which the lungs were wounded, this symptom was present in two; of seven fatal cases in which the lung was not wounded, it was present in one; in twelve cases of recovery, it was present in one. It was present in two out of twelve fatal cases, in the British Director General's reports, and in one of nine cases of recovery. Dr. Williamson (*op. cit.* p. 80) mentions that "twelve perforating gunshot wounds of the chest arrived from India;" * * in four instances, it is mentioned that air passed out of the wounds in the chest. * * "In all these cases, there can be little doubt of the lung having been wounded."

when the lung is uninjured. It may gurgle in a deep oblique emphysematous wound in the soft parts, or in wounds penetrating the anterior mediastinum and pericardium, and not communicating with the pleural cavity. When there is a large penetrating wound of the pleural cavity and the lung is really wounded, tromatopnœa ceases, except in coughing and sneezing, for the simple physical reason that there is no confined body of air subjected to the alternate movements of the thorax (Fraser). Tromatopnœa was not a frequent symptom. It is noted in forty-nine instances only, among the eight thousand seven hundred and fifteen cases of penetrating wounds of the chest. Surgeon J. T. Woods, in the report from Chattanooga already cited, remarks:

"Respiration through the thoracic opening, exhibiting the characteristic mucous bubbling, in cases where the ball could not have failed to perforate the lung tissue, was not a common symptom, but occurred with most certainty when the perforation was in the upper part, and this occurrence was accompanied by much increased difficulty of respiration,—a symptom that was astonishingly slight in those cases in which the above-mentioned mechanical difficulty occurred, or pneumonia supervened."

Brigade Surgeon P. Pineo, U. S. V.,[1] attached much importance to this sign. He writes, in the second year of the war:

"Of Gunshot Wounds of the Lung, let me say one word: Three cases of a bullet passing through the substance of the lung, producing emphysema, and the air issuing from the aperture made by the bullet, so as to make the case unmistakable, have occurred under my observation, in which the patients recovered. There has been some question about the probabilities of recovery in gunshot wounds of the thorax, and I therefore mention these cases, thinking that you may be interested to know of such favorable results, in so many cases, of so grave a lesion."

Tromatopnœa was observed in only eleven of the cases of which abstracts have been given in this chapter.[2] Of these, seven recovered and four died. The lung was wounded in three of the fatal cases, and probably in the fourth. In fifty-one cases analyzed by Dr. Frazer (*op. cit.*, p. 52) it was present in seven. This sign of lung wound must be regarded as infrequent and far from pathognomonic.

Hæmoptysis.—Until recently most writers on military surgery have taught that spitting of blood soon after the reception of a wound of the chest was a certain sign that the lung was wounded.[3] This view, though still maintained by some authors,[4] is now known to be erroneous. It is desirable, therefore, to arrive at a correct estimate of the diagnostic value of this symptom.

[1] PINEO. *Boston Medical and Surgical Journal*, 1862, Vol. LXV, p. 373.

[2] Cases of Osborne, p. 483; L——, p. 485; Edkin, p. 487; Brownlee, p 488; Berrien, p. 491; Collins, p. 491; L——, p. 492; Lewis, p. 494; Case 2, p. 510; Dalien and Burke, p. 575. Dr. Ashhurst (*Principles and Practice of Surgery*, 1871, p. 357) regards tromatopnœa as "perhaps, more characteristic than any other single symptom of wound of the lung," though he has "witnessed it in cases in which there was every reason to believe that the pleura alone was injured."

[3] BELL (*Discourses on the Nature and Cure of Wounds*, Edinburgh, 1795, Part II p. 37) says: "If the patient spits blood he fears a wound of the lungs; if there be an emphysema he is sure of it;" and also at p. 51: "If spitting of blood and the emphysema, or windy tumour, come on, unquestionably he is wounded in the lungs." SCHMUCKER (*Chirurgische Wahrnehmungen*, Berlin. 1774, Zweiter Theil, p. 20) speaks of the spitting of blood as evidence of wound of the lung. HECKER, A. F. (*Kurzer Abriss der Chirurgia Medica*, Berlin, 1808, S. 793), is of the same opinion. BALLINGALL (*Outlines of Military Surgery*, Edinburgh, 1855, 5th ed., p. 329) regarded hæmoptysis as a more certain sign than the issue of air from the wound in expiration. "Symptoms less equivocal are: Bloody expectoration; severe, urgent, and increasing dyspnœa; insupportable anxiety and faintness immediately succeeding the accident; these are the most prominent symptoms of a wounded lung." GUTHRIE (*Commentaries, etc.*, 6th ed., pp. 453, 467, 474, 475) is evidently of opinion that hæmoptysis, with the passage of air by the wound, is proof of injury of the lung. THOMSON, as has been seen (p. 635), regarded tromatopnœa as pathognomonic, and hæmoptysis as a sign of nearly equal certainty. (*Rep. of Obs. in Mil. Hosp. in Belgium*, p. 80.) "That the lungs have been wounded may be inferred with nearly equal certainty." LAWRENCE (*London Lancet*, 1830, Lectures, Vol. I, p. 555) speaks of two circumstances, which, viewed in combination, showed that the lung had suffered direct injury, viz., hæmoptysis and emphysema. STROMEYER (*Maximen der Kriegsheilkunst*, 1855, S. 600) says that in shot wounds the lung is always contused, "wie dies sich auch aus dem Blutspeien ergiebt, welches bei diessen Wunden *niemals* fehlt."

[4] Dr. MACLEOD still reiterates (*Notes on the Surgery of the War in the Crimea*, p. 236) the routine statement "blood by the mouth and blood and air by the wound are unequivocal proofs that the lungs have been injured." Assistant Surgeon T. K. BIRNIE, 1st Royals (*London Lancet*, 1856, p. 682), reports two cases of recovery from supposed lung wound, the diagnosis being based on the presence of hæmoptysis; HANCOCK (*London Lancet*, 1856, p. 686) mentions several cases of recovery after chest wounds in which wound of the lung was "evidenced by expectoration of blood." MATTHEW (*Surg. Hist. Crimea*, Vol. II, pp. 315) mentions two cases in which hæmoptysis took place, "rendering it highly probable that the lung had been injured."

Mr. Lawson and Dr. Schwartz[1] believe that hæmoptysis is invariably present in extensive wounds of the lung only. But there is in the Museum of St. George's Hospital a preparation from a patient who survived for eight days a laceration of the lung four inches in length by two inches in depth, and had no hæmoptysis.

Of the cases carefully observed in the Crimea by Dr. Fraser, only one out of nine fatal with wound of the lung had hæmoptysis. Of seven fatal cases, in which the lung was not wounded, two had hæmoptysis; of twelve cases of recovery, three had hæmoptysis. The appearance of this symptom is only noted in four hundred and ninety-two, of the eight thousand seven hundred and fifteen penetrating wounds recorded in TABLE XXVI, though it might have been present and unmentioned in others. It was absent in the larger number of cases of undoubted shot wounds of the lung, of which specimens are preserved in the Army Medical Museum.

Hennen[2] recognized that bloody sputa was not indicative necessarily of lung wound. Mr. Blenkins[3] also speaks positively on this point: "Hæmorrhage from the lungs by the mouth, or bloody expectoration as it is termed, is by no means a certain sign of wound of those organs." Dr. Appia,[4] also, states that hæmoptysis is not a pathognomonic symptom of penetration, it may be only the casual complication of some superficial injury."

Professor Gross[5] says: "A discharge of blood by the mouth, however, is not a positive evidence of penetration of the lung, experience having shown that the mere concussion of the chest by a ball or shot is capable of producing it." Dr. Ashhurst,[6] likewise, correctly observes that in wounds of the pleura and lung, "hæmoptysis is usually, but by no means invariably, present, the expectorated matter being frothy mucus mixed with blood, or more rarely pure blood in considerable amount." Dr. Chisolm[7] remarks: "From our large experience of perforating chest wounds, we would infer that the spitting of blood is a very deceptive diagnostic sign of lung wound. I have adduced, in this chapter, abstracts of nineteen cases in which there was hæmoptysis without wound of the lung. Four were unaccompanied by any external lesion. The existence of hæmoptysis is noted in only twenty-four of two hundred cases in which the lungs were wounded. Dr. Fraser (*op. cit.*, p. 61), Baudens (*op. cit.*, p. 222), and Matthew (*op. cit.*, p. 314), cite instances of hæmoptysis in cases unattended by wound. A similar case was under my care: H. W. Torrey, 27th Massachusetts Volunteers, aged 21 years, a tall, slender recruit, was struck in the left side, September 14th, 1861, by a comrade, in practicing the manual of arms. Copious hæmoptysis ensued. No fracture. Large moist crepitation was the only modification appreciable on auscultation and percussion. Rest and low diet were enjoined, with cold acidulated drinks and salines. He continued to cough up blood, at intervals, for three days, and then rapidly recovered.

In view of these facts, it must be concluded that hæmoptysis is of doubtful value as a sign of lung wound, except in conjunction with other symptoms.

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[1] LAWSON, in *Druitt's Vade Mecum*, 10th ed., 1870, p. 484. SCHWARTZ (*Beiträge zur Lehre von den Schusswunden*, Schleswig, 1854, S. 112): "In severe wounds of the lung, a great quantity of partly dark, partly light-colored blood will issue from the mouth and the opening of the wound."

[2] HENNEN (*Principles of Military Surgery*, London, 1829, p. 372): "I have traced a ball by dissection, passing into the cavity of the thorax, making the circuit of the lungs, penetrating nearly opposite the point of entrance, and giving the appearance of the man having been shot fairly across, while bloody sputa seemed to prove the fact, and, in reality, rendered the same measures, to a certain extent, as necessary as if the case had been literally as suspected. The bloody sputa, however, were only secondary, and neither so active nor alarming as those which pour at once from the lung when wounded." [3] BLENKINS. Addition to article *Gunshot Wounds* in the eighth edition of Cooper's Dictionary, Vol. I, p. 826.

[4] APPIA. *The Ambulance Surgeon.* English translation by Messrs. Nunn and Edwards. Edinburgh, 1862, p. 173.

[5] GROSS. *A System of Surgery*, Philadelphia, 1872, p. 417.

[6] ASHHURST. *The Principles and Practice of Surgery*, Philadelphia, 1871, p. 357.

[7] CHISOLM. *A Manual of Military Surgery*, Columbia, 1864, p. 318.

Dyspnœa.—This is admitted to be a very uncertain sign of wound of the lung or even of penetration of the pleural cavity. It may be present when the lung is uninjured, or absent when it is seriously wounded. It may be due altogether to moral causes, and constitute one of the chief elements of the condition termed shock by some surgeons.[1] It is then transitory. It is most intense when the walls of the thorax expand freely on inspiration, while obstructions in the bronchial tubes prevent the air from inflating the vesicles and hinders the lung from following the movements of the chest wall. When the air enters and passes out freely through a wound, there is no dyspnœa unless from compression of the sound lung by effusion, or from hindrance of the movements of the lung by old adhesions or through some obscure lesion of the nerves; for when the lung has collapsed and the pressure of air admitted through the glottis and the wound is equal, the collapsed lung offers no opposition.

Of fifty-one cases of penetrating shot wounds of the chest, analyzed by Dr. Frazer, dyspnœa was present in thirteen only, as follows: in three of nine fatal cases in which the lung was wounded, in three of nine fatal cases in which the lung was uninjured, in two of twelve cases of recovery, in four of twelve fatal cases from Dr. Matthew's report, in one of nine cases of recovery from the same report. In two hundred and fifty-two cases of which abstracts are given in this chapter in which the symptoms were carefully noted, dyspnœa was present in fifty—eighteen of recovery and thirty-two fatal.[2]

Nervous Anxiety.—Great agitation, nervous anxiety, and general prostration sometimes follow the reception of wounds of the chest.[3] The alarm and apprehension accompanying this depression overcome the fortitude of men of the steadiest self-control and most devoted courage.[4] In analyzing this condition, the surgeon will endeavor to discriminate between the symtoms due to impeded respiration, those arising from faintness

[1] Of the effect of venesection in relieving dyspnœa, as practiced in some instances, in the Franco-Prussian war of 1870–71, Dr. H. FISCHER (*Kriegschirurgische Erfahrungen*, Erlangen, 1872, S. 126) remarks: "In cases of severe dyspnœa and cyanosis we practiced venesections. If not made too copiously the desired effect is reached; momentary relief of breathing and less oppressed circulation of blood, without depriving the patient of more blood than he needs for the approaching tedious suppuration. * * * In several cases we observed excellent results, * * * in other cases the effect of the venesection was very transient. In one instance we made repeated venesection, with only a very rapidly passing relief."

[2] VIDAL (*Traité de Pathologie Externe et de Médecine Opératoire*, 5ème éd., 1860, T. IV, p. 66) remarks that slight punctures of the chest may induce dyspnœa, cough, and nervous anxiety: "Les piqûres les plus légères de la poitrine peuvent donner lieu aussi à une série de phénomènes qui semblent accuser ordinairement les lésions les plus graves de l'économie; ainsi: refroidissement de la peau, resserrement du pouls, suffocation, syncope même, toux, enfin la plupart des symptômes de la lésion d'un organe profond, d'une hémorrhagie interne; et cependant ni organe, ni vaisseau un peu considérable n'ont été lésés. On observe ces phénomènes surtout dans les blessures reçues en duel. Quel que soit le courage des champions, au moment du combat, le sang ne circule pas normalement et l'innervation n'est pas régulière, on n'est pas sans émotion; s'il se joint à cet état moral une plaie à la poitrine, le blessé en conçoit les plus vives inquiétudes, et si la peur ne l'a pas encore pris, il est voisin d'en être possédé. On conçoit alors la production des phénomènes que je viens d'indiquer, et l'effet salutaire, sur des hommes peu éclairés, des succions qu'on faisait autrefois, accompagnées de paroles plus ou moins mystérieuses: le tout formait une pratique qui s'adressait au moral de l'individu, lequel était bientôt radicalement guéri quand le danger n'était pas physique. Ces phénomènes nerveux peuvent aussi s'expliquer par la lésion des nerfs qui animent les parois de la poitrine. Or on sait qu'il en est de *respirateurs*, comme le dit Ch. Bell: eh bien, la lésion de ces nerfs peut donner lieu à une toux, une suffocation, qui simulent singulièrement une lésion des poumons ou un épanchement pleurétique."

[3] Professor GROSS (*System*, Vol. II, p. 445) says: "Death from mere shock is by no means uncommon in wounds and injuries of the chest; cases of the kind are frequently met with both in civil and military practice, and their occurrence has occasionally been noticed where, upon dissection, no serious lesion has been detected to account for so untoward a result."

[4] It is within the observation of most medical men, that the behaviour of men, when death is imminent, though partly governed by the measure of fortitude and courage they possess, is largely affected not only by physical but by mental and moral causes, and especially by their convictions as to a future state, and by their social relations in the present. Religionists of equal courage may betray excessive trepidation, or extreme exaltation and confidence in future felicity. Skeptics may contemplate the approach of dissolution with serene indifference, or with remorseful anguish. Life is dear when gladdened by domestic joys and by success; little valued when a lonely struggle with adversity. In some diseases, as in cholera, patients commonly manifest little concern as to their fate. The effects of severe injuries are usually attended by apprehension and anxiety, especially when the great cavities are penetrated; but this is not a uniform consequence. It is most common and characteristic in wounds of the abdomen. A factitious, transitory calmness, indicating, perhaps, that the sympathetic nervous system is overwhelmed, is dreaded by surgeons. Such a condition is occasionally noticed when limbs are torn off. General Moreau's case was an instance. It has been remarked that those dying from sword wounds have a languid resigned aspect, while those killed by shot, present a firm defiant expression, and differences in attitude in the dead on the field have also been noted. (Observations by Chenu, Perier, Brinton.) It is probable that these differences depend very much upon the structure implicated, and are modified as the mortal wound affects the nervous, circulatory, or respiratory system. (See Sir BENJAMIN COLLINS BRODIE'S *Psychological Inquiries. Being a Series of Essays intended to Illustrate the Mutual Relations of the Physical Organization and the Mental Faculties;* in the edition of his works collected and arranged by Mr. Charles Hawkins, London, 1865, Vol. I, p. 117.)

from loss of blood, and those dependent on lesions of the nervous system, and on mental and moral causes. If this were always done, there would be fewer vague descriptions of shock and of conditions of undefinable, indescribable anxiety and nervous depression. Authors assert that patients with penetrating wounds of the chest frequently die from shock; when dissection reveals no appreciable mortal lesion. I have never met with a case of the kind, nor with a carefully written observation corroborating this assertion. Surgeon Baruch describes (p. 610, *ante*) an expression of anxiety as very peculiar in penetrating wounds of the chest; but I am satisfied that this expression is much less common in such injuries than in penetrating wounds of the abdomen, and that the explanation is to be sought in the lesser implication of the sympathetic system of nerves in chest wounds.

Other Signs.—Apart from emphysema and lumbar ecchymosis, which have been discussed, the other signs of penetrating wounds of the chest are those attendant on hæmorrhages, and those that accompany inflammations or intrathoracic effusions, and those connected with the appearance of the wound, and in some instances of the weapon. The signs due to hæmorrhage have been referred to on pages 519, 530, and 624, in treating of wounds of the blood-vessels, and of the heart, and of hæmothorax. Great attention should be directed to the detection of the bleeding point when the situation of the wound indicates the probability of a lesion of the intercostal or internal mammary arteries. A spatula or curved piece of card-board introduced between the lips of the wound may render the source of the hæmorrhage visible, or the finger introduced may feel the warm arterial jet; or it may be requisite to enlarge the wound. The chest should be exposed and cold applied while the search is prosecuted. The feeble pulse and clammy skin will reveal, and auscultation and percussion will guide, in the more copious hæmorrhages. In rare instances of wounds in the sternal, subclavian, and axillary regions, the pulsation of the great vessels and even of the heart may be seen.[1] The physical signs derived from auscultation and percussion furnish the most reliable indications in the consecutive inflammations and effusions, and will be interpreted in connection with the rational signs. Though, immediately after the reception of the injury, there may be moist crepitus, the gurgling of tromatopnœa, various friction sounds,[2] absence or diminution of the respiratory murmur, and modifications in resonance, the surgeon will listen in vain for uniform sounds characteristic of particular lesions.[3]

If there be a wound of entrance only, the presence of a foreign body, in a shot wound, will be suspected, but not positively affirmed, for the missile may have dropped out or have been removed with the clothing. If there are two wounds, the surgeon will not conclude hastily that one is necessarily a wound of exit; for it may happen that the man has been struck by two balls and that both have lodged. This subject of the diagnostic signs of entrance and exit apertures, will, however, be fully discussed in the chapter on

1 See HENNEN'S case LXII (*op. cit.*, p. 395), Lieut. Colonel H——, wounded at Waterloo, under the centre of the left clavicle: "I was very curious to see the state of the artery; it lay awfully pulsating *in situ*, which uncovered arteries are not always observed to do." See also Professor Billroth's cases already referred to, and a number cited in this work.

2 Though refusing to accept Jobert's and Bouillaud's *bruits de frottement* as distinctive and pathognomonic indications of wounds of the heart, I would by no means depreciate, in the slightest degree, the value of physical exploration in such cases. One cannot but read with a touching interest the recent lectures of Professor Piorry on the utility of percussion in the diagnosis of chest wounds. Though desolated by the afflictions of his country, the veteran professor says that he wishes to impart to the young surgeons whatever aid a physician can offer, and has, therefore, printed this series of discourses on plessimetrism, an art, which, in the perfection to which Professor Piorry has carried it, will perhaps perish with him.

3 Mr. ERICHSEN, *The Science and Art of Surgery*, 5th ed. Vol. I, p. 434, says that in wounds of the lung: "On auscultating the chest immediately after the infliction of the injury, and before there is time for the supervention of any consequences, a loud rough crepitation will be distinctly audible at and around the seat of injury." The surgeon does not have an opportunity of examining the wound before there is time for the effusion of blood. At the earliest moment he can examine, he may or may not hear loud rough crepitation, near or distant, according to the extent of the wound and the amount of effusion in the larger air-tubes.

gunshot wounds in general.[1] The surgeon will gain all the information he can from observing the external wound, using his finger, as far as he judges prudent, to determine the extent of the wound and the presence or absence of foreign bodies, but not employing the probe in early examinations. He will next endeavor to ascertain if the lung is wounded. S. Cooper directs to "make the patient expire strongly; during the succeeding inspiration, as completely as possible to cover the wound, to prevent the entrance of external air; after once or twice repeating this process, if air continues to be expelled, the lung must be wounded;" but this plan can hardly ever be made satisfactory, even with the aid of the flame of a taper. The injection of liquids into the cavity to determine this point is dangerous, and has long since been condemned. In stabs and sword thrusts, something may be learned from the extent in which the weapon is stained with blood. The aid that may be derived from placing the patient in the posture in which the wound was received, will not be forgotten. However ingeniously and skilfully the examination may be conducted, there are many cases in which the surgeon must be contented to remain in doubt, and to refrain from hazardous explorations.

The extensive and varied data adduced in the discussion of the mortality of chest wounds, and especially in relation to penetrating shot wounds, furnish a reliable basis for a general prognosis. The prognosis of individual cases must be formed from the special circumstances attending them. In the footnote[2] may be found the aphorisms on this subject formulated by John Bell. The practitioner will bear in mind that the chief early danger is from hæmorrhage, and will remember the encouraging assurance of the experienced Hennen,[3] on the hopefulness of the case where "the third day has been safely

[1] Medico-legal questions may sometimes depend upon the solution of this point. A Confederate officer was confined in the military prison at Norfolk, in 1863, under sentence of death for murder. While in bed, he was shot through the left chest, by the colored soldier at his door,—the smooth-bore musket, in the sentinel's hands, being charged with a round ball and three buckshot, the distance from the bed to the sentinel's post being about twelve paces. A little below and within the left nipple were three wounds, one large and two small, the edges blackened, stellate, slightly inverted. Between the spine and lower angle of the left scapula was a single wound, large and ragged. This was on a plane two inches and more lower than the anterior wound. There was profuse hæmothorax, and the patient died in thirty-six hours. Aware of his approaching end, he stated that he had raised himself in bed to change his position, and that the sentinel appeared at the door and ordered him to lie down, and fired almost immediately after, the charge taking effect in his left breast. The sentinel testified that the officer sat up in bed and was endeavoring to raise the adjacent window,—that he thrice ordered him to lie down, and then fired, when the officer's back was toward him. The sergeant of the guard testified that the sentinel was instructed to fire, if the prisoner attempted to escape. At a court of enquiry, it was argued on the one hand, that the three anterior wounds were wounds of entrance, that the buckshot had probably lodged, and that the ball with its greater momentum had emerged at a lower plane. On the other side, it was contended that the ragged posterior wound marked the entrance of the entire charge; that the three anterior wounds marked the exit of the ball and buckshot.

[2] JOHN BELL (*op. cit.*, Part II, p. 51) embodied his views of the prognosis in the following series of aphorisms: "1st. If the patient lies oppressed, tossing, insensible, his face ghastly, and his extremities cold, his condition is very doubtful, it looks much like a wound of some vessel near the root of the lungs; and if so, he is surely gone. 2dly. If the oppression come on more slowly, the pulse only hurried and fluttering, and the extremities not so cold, there is reason to hope that his wound is merely in the edges of the lungs; and, as it is at a distance from the great veins and arteries, he may escape. 3dly. If spitting of blood, and the emphysema, or windy tumor comes on, unquestionably he is wounded in the lungs; but that wound is not always fatal. If either the blood do not flow in upon the lungs in great quantity, or if, by our profuse bleedings, that bloody exudation into the lungs can be restrained, then he may be saved. 4thly. If, when there is much oppression, we put our finger into the wound, let some blood out, and so give relief, we are sure that the suffocation proceeds from blood extravasated in the thorax; and that kind of suffocation we know to be less dangerous by far than that proceeding from blood poured into the proper cavity or cells of the lungs, *i. e.* into the air-cells into which we draw the breath, and which, while they should be filled with air, are choked with blood. 5thly. If a bullet passes fairly through and through, the patient is safer; he is in great danger, if it stops, whether within the thorax or in the lungs; for when it passes through, as soon as we have saved him, by bleedings, from the first dangers, he is saved. But when it remains within the chest, he is exposed to tedious suppurations, incurable sores, hectic, wasting, and death; and nothing so wearies the surgeon, or depresses the patient's hopes, as an unceasing flow of matter, and a fistulous sore; nor can anything be more distressing to the surgeon than the seeing a patient slipping through his hands (to use so vulgar a phrase), more especially if, during a lingering distress, he has thought it necessary to support the friends with hopes and promises; for then it falls peculiarly on all concerned,—on the surgeon, who has suggested or allowed such hopes, as well as on those who have permitted themselves to be thus deceived."

[3] Among the various authorities on the prognosis, we find that HENNEN (*Mil. Surg.* 3d ed. p 391), while "unwilling to lull either a patient or a surgeon into a false security, or to underrate the real dangers of any case," has "seen many wounds of the thorax, both from pike and sabre thrusts, and from gunshot, do well ultimately;" that he "cannot but hold out great hopes where the third day has been safely got over; for, though occasional hæmoptysis may come on at almost any period during a cure, and its approach can neither be entirely prevented nor anticipated, the more deadly hæmorrhages are usually within the first forty-eight hours; and yet to this alarming symptom, when within moderate bounds, the safety of the sufferer is often due." This guarded statement and the often-quoted remark of Dr. Gregory, of Edinburgh, that of twenty-six wounds of the thorax received at the battle near Quebec, two only were fatal," have undoubtedly had much influence with practitioners in this country, in their prognosis of chest wounds, having been repeated with approval, for many years, in our leading medical school, by Professor W. Gibson. Sir GEORGE BALLINGALL taught (Outlines, etc., 5th ed.) that "the expanded surface of the thorax renders wounds of this region frequent in battle, while the vital importance of the organs lodged within it render them peculiarly dangerous." GUTHRIE (*Comm.* p. 462) is of opinion that "gunshot wounds of the chest, penetrating the

got over;" but will not forget that Hennen had to deal with wounds inflicted by the sword and pike and missile of the "old Brown Bess," and that the elongated heavier balls employed in modern warfare cause injuries more deadly. While using every precaution to arrest inflammatory complications and strictly enjoining low diet and absolute rest, he will not anticipate pleurisy and pneumonia as necessary consequences, or indulge in prophylactic depletory medication; he should dread effusions more than inflammations. If he can save a third of the patients that are wounded in the lung he may esteem himself happy, and the survivors thrice fortunate.

The lamented Tripler, in his excellent lecture on *Wounds of the Chest*,[1] while admitting that the signs of wounds of the lung are singly equivocal, regrets the exceptions taken by Dr. Fraser to the generally received views "as calculated to do injury in inexperienced hands, by unsettling opinions in very plain cases, thus leading to indecision in practice and uncertainty in diagnosis." It is, therefore, proper to say that in indicating the uncertainty of individual signs, the object here had in view is rather the encouragement of the inexperienced in the careful investigation of cases, as Dr. Gerhard was wont to do, in his unsurpassed clinical instruction, when he constantly dwelt upon the fallacy of individual symptoms and exhorted the student to familiarize himself with the "whole case." It may further be proper to reiterate that a majority of the signs discussed, when existing in conjunction, may establish the diagnosis with a precision little short of certainty.

I cite, in foot-note, Samuel Cooper's rules[2] for making out the diagnosis in incised wounds of the chest, remarking that intra-pectoral injections are not now considered permissible; and a quaint extract from the oldest work[3] on surgery printed in English, on the means of determining wounds of the lung by the passage of air. I will add that in the latest contributions on the surgery of the late Franco-German war, the influence of the size of projectiles upon the fatality of shot wounds is particularly insisted on, and the diminished mortality ascribed, in a measure, to the small bulk of the chassepôt missile compared with the large conoidal balls used in most muzzle-loading arms. And, lastly, that there has been little investigation of the state of animal temperature in cases of severe wounds, and that aid in the prognosis of chest wounds may be sought in careful thermometric observations.

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cavity, are always exceedingly dangerous." Mr. G. LAWSON (Druitt's *Surgeon's Vade Mecum*, 10th ed., 1870, p. 124) says, "the prognosis in all penetrating wounds of the chest is unfavorable, particularly if the ball has lodged." On the other hand, JOHN BELL declares (*Principles of Surgery*, ed. 1826, Vol. I, p. 431, and *Discourses on the Nature and Cure of Wounds*, Part II, p. 3) "a wound of the substance of the lung is far from being mortal." Among German authors, RICHTER (*Anfangsgründe der Wundarzneykunst*, Göttingen, 1800, B. IV, S. 326) says: "Lung wounds are generally dangerous on account of the fatal loss of blood, of the effusion of blood into the cavity of the chest, or of pneumonia." SCHWARTZ, H. (*Beiträge zur Lehre von den Schusswunden*, Schleswig, 1854, S. 114), remarks: "Die Prognose der Brustwunden mit gleichzeitiger Lungenverletzung ist ohne Ausnahme eine sehr ungünstige. * * * Sind fremde Körper, als Kugel, Kleidungsstücke, Rippensplitter in der Lunge selbst oder auch nur im Pleura Sack geblieben, so ist die Prognose um so schlechter." Among the French, the opinions of Ravaton, LaMotte, and others have been cited. VIDAL says (*Traité de Path. Ext. et de Méd. Op.*, 5ème éd., T. IV, p. 71): "Wounds of the lungs are certainly dangerous; but if compared with wounds of other viscera, the prognosis will appear relatively less grave. A wound of the heart, a wound of the brain, of the viscera of the abdomen, all things being otherwise alike, are graver than wounds of the lung."

[1] TRIPLER, *Handbook for the Military Surgeon*, Cincinnati, 1861, Chapter VI, p. 74. I have not often referred to this admirable compendium, presuming that its contents are as "familiar as household words" to Army medical officers.

[2] COOPER, *A Dictionary of Practical Surgery*, 1838, Vol. II, p. 481: 1. Placing the wounded person in the same posture in which he was when he received the wound, and then carefully examining, with the finger or probe, the direction and depth of the stab. 2. The examination, if possible, of the weapon, so as to see how much of it is stained with blood. 3. The injection of fluid into the wound, and attention to whether it regurgitates immediately or lodges in the part. 4. The color and quantity of the blood discharged from the wound are to be noticed, and whether any is coughed up. 5. We are to examine whether air escapes from the wound in respiration; and whether there is any emphysema. 6. Lastly, the state of the pulse and breathing must be considered.

[3] In Chapter XLVIII, "*Of the wounde in the brest*," in the English version of JHEROME OF BRUYNSWYKE'S "*The noble experyence of the vertuous handywarke of surgeri*," printed "in the yere of our lorde God MDXXV, and the XXVI day of Marche (reputed the first work on surgery in the English language), Hieronymus says: "And that token that the wounde gothe through the breest, or in the holnes of the brest is, as the wynde cometh out the wounde, principaly whan the nose and the mouth is stoppeth, than shall yow hãge a lytell feder on a threde afore ye woũde, is the woũde through than shall meue the feder."

Treatment.—Besides the rules that govern the management of wounds and injuries in general, the local and constitutional measures that are especially indicated in those of the chest, in their several subdivisions, are here to be considered.

Local Treatment.—To secure rest, position and the broad chest bandage are the most generally applicable measures in injuries of the thorax, whether attended or not by breach of surface. In wounds, after stanching the bleeding, cleansing the parts, and removing all foreign bodies, the further conduct of the surgeon must be governed by the extent and nature of the lesion. All superficial wounds should be closed, with a view to early adhesion. In extensive incisions and lacerations, it will be proper to use sutures or *serres-fines;* but, in coughing and inadvertent motions of the patient, they often tear out; and, usually, simple dressings[1] will suffice. In many cases of penetrating wounds, surgeons preferred to support the injured side by broad strips of adhesive plaster made to encompass two-thirds of the chest and fenestrated at the wound. This was considered a very secure dressing, and acceptable to the patient. A few preferred the starch bandage, but its application was not always convenient in the field. The gypsum bandage, which enjoys much favor among the Russian,[2] Austrian, and some North German military surgeons, was not reported to have been used. When there was profuse discharge, the compresses were conveniently covered with carded oakum.[3]

In profuse primary hæmorrhages, it was always customary to make cold applications to the chest, ice being used when attainable. Then, if the bleeding point could be discovered, the prudent surgeon did not rest until the bleeding was arrested by the ligature, or, failing in this, by compression. The endeavor to find and secure wounded vessels, instead of plugging the wound with lint and Monsel's salt, was a distinction between skilful and heedless surgery. When it was impossible to reach the source of the internal bleeding, it was considered best to close the wound and to promote the occlusion of the bleeding vessels by general means. In connection with hæmothorax, hermetically sealing, wounds of arteries, and operations, the circumstances that should decide whether the wound should be left open or closed have been fully discussed. The treatment of effusions by thoracentesis or incisions, the management of foreign bodies and of fractures, and the dilatations and excisions they sometimes necessitate, have also been considered at length. Stabs were not very common, as has been seen, and no instance of the use of suction or the "secret dressing"[4] is mentioned in the reports. Whatever else pertains to the local treatment has been adverted to incidentally in connection with the complications or in details of individual cases.

General Treatment.—The uncomplicated non-penetrating wounds of the chest require no exceptional measures beyond a judicious restriction of the diet and the means necessary to ensure rest. Contusions and concussions, with internal injuries, may call for active

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[1] What is understood by "simple dressing" in the United States service, is the approximation of the wound by adhesive strips, covered by a compress spread with cerate, or saturated with water, and supported by a light bandage, with oiled silk interposed if water dressing is used. Antiseptic dressings and carbolized ligatures did not come into use until after the war.

[2] Pirogoff (*Grundzüge der Allgemeinen Kriegschirurgie*, Leipzig, 1864, S. 537) writes: "Had there been more time and a sufficient supply of gypsum, I should have ordered the gypsum bandage to be used much more frequently in complicated gunshot fractures of the ribs. Unfortunately, I had to reserve our gypsum supply solely for comminuted fractures of the extremities. But in several severe cases of gunshot fractures of the ribs the gypsum bandage was applied with excellent results. * * * I advise the young surgeon to bestow more time and zeal upon the proper application of this bandage, than upon the extraction of fragments of bone or wedged-in missiles." Neudörfer (*Handbuch der Kriegschirurgie*, Leipzig, 1867, Zweite Hälfte, S. 602) says: "It is therefore necessary to prevent the voluntary or involuntary large expansion of the chest wall, and that can only be done by a suitable gypsum bandage."

[3] This was a favorite dressing in all freely suppurating wounds. The tarry odor masked foul smells, and the fibres of the oakum were light and absorbed well. According to Mr. Pollock (*London Lancet*, January, 1870) its advantages are appreciated in England.

[4] Consult Anel, *L'Art de sucer les plaies, sans le servir de la bouche d'un homme*, Amsterdam, 1707; Ludwig, *De Suctione vulnerum Pectoris*, Lipsiæ, 1768; Lamotie, *Traité complet de chirurgie*, 1832, Vol. III, p. 20; J. Bell, *Discourses on Wounds*, 1795, Part II, p. 52.

restorative treatment; but the main interest in this subject centres in the questions whether, in penetrating wounds, venesection shall be practiced to avert hæmorrhage, or to arrest or subdue inflammation? There were no doubts on the subject until recently. The common voice of the profession sanctioned the paradox that bleeding was the surest means of arresting internal hæmorrhage, and concurred in placing venesection foremost among the remedies for inflammation. Long after the investigations of medical pathologists had undermined the foundations of the theory of bleeding for inflammation, the doctrine that venesection was indispensable in the treatment of wounds of the chest held its ground.

Though there are in the writings of John Hunter and John Bell some evidences of misgivings as to the necessity of the heroic depleting measures long practiced in cases of penetrating wounds of the chest, I agree with Dr. Ashhurst, that the credit of the first formal protest against the common practice of venesection in these cases is due to Dr. Patrick Fraser, whose interesting monograph, giving the results of his extended personal observation during the Crimean War, I have repeatedly quoted. It was published in 1859, when it required no little courage to oppose the prevalent practice, described by Ballingall, at the military medical school at Edinburgh, in 1855, as that "which every sensible writer on this subject has taught and every experienced practitioner has adopted;" and Mr. Guthrie was alive, to castigate the cautious or recalcitrant medical officer who dared to question the teachings of the Peninsular campaign. Favored by the wide-spread distrust in the efficacy of depleting measures in inflammation, Dr. Fraser's views received much consideration, and their correctness in the main was conceded by several of the leading British military surgeons, particularly by Dr. Matthew,[1] Mr. Lawson,[2] and Mr. Blenkins.[3] Dr. Macleod and Mr. Gant[4] opposed the salutary change in practice, the former announcing in contradiction of the official annalist, that, in the Crimea, "it was very generally observed that those cases did best in which early, active, and repeated bleedings were had recourse to," and the latter being "in favor of decided, and, as it may be termed, knock-down blood-letting." But, as the facts adduced by the former did not sustain his

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1 Dr. Matthew did not concede the utility of venesection in hæmorrhage, but admitted that its value in traumatic inflammation was overestimated: "Supposing the first danger of death by exeessive loss of blood not to have arisen, in consequence of no large vessel having been wounded, or this danger to have passed over, the means adopted by nature to repair the mischief appear to be the exudation of plastic material glueing the various parts involved in the injury together, and thus isolating them; and the more effectually and perfectly she does this, the greater is the chance of safety to the patient; and, as before stated, in discussing the subject of wounds of the head we believe venesection (for any other purpose than that of a styptic, as pointed out above) to be not only useless, but positively and actively injurious, as tending to prevent or render less perfect the adhesive process. The doctrine of the older surgeons, that adhesion depended upon a less degree or smaller amount of the same process which produces pus, and that as inflammation was almost certain to follow these injuries, prophylactic bleedings, to as great an extent as could be borne with safety to life, should be employed as tending to limit the inflammation to the less degree, or the adhesive stage, seems not at all tenable in the present day. Adhesion and pus formation seem to depend upon two essentially different processes, although the term inflammation has been applied to both; and although we are at present not fully acquainted with the nature of the difference, the opinion appears to be daily gaining ground that the too early abstraction of large quantities of blood favors the latter, while there can be little question that it impedes the former process. We are, however, by no means prepared to state that exceptional cases of plethora, in which such prophylactic venesection may be beneficial, do not occasionally occur; but they appear to be rare, and indeed are not likely to exist among soldiers on active field-service. Practical experience also, to which all theoretical opinions must give way, seems, during the late war, to point in this direction, and to do so independent of, and making allowance for, the cachectic state before alluded to, into which the bulk of the army had at one time fallen."

2 LAWSON, G. (*On Gunshot Wounds of the Thorax*), gave his opinion that bleeding in these injuries is not called for as recommended by Guthrie, Hennen, and the older army surgeons, and certainly was not applicable to the cases occurring in the Crimea.

3 BLENKINS. Article—*Gunshot Wounds*, in the 8th edition of *Cooper's Dictionary of Practical Surgery*, London, 1861.

4 MACLEOD, *Notes on the Surgery of the War in the Crimea*, Churchill, 1858, p. 237; GANT, *The Science and Practice of Surgery*, Churchill, 1871, p. 885. I say that Dr. Macleod's facts do not support his conclusions, because, though he reports eight recoveries in thirteen cases of shot wounds of the chest, it is not at all clear that the eight recoveries were complete, or that they were all from penetrating wounds, or that the bleedings practiced were of benefit, and because what he thought was generally observed, was denied by others, who had equal or greater opportunities for observation. Of fifty-one of the Crimean cases of chest wounds, carefully analyzed by Drs. Matthew and Fraser, free venesection was employed in seven,—in six of thirty fatal cases, and in one of twenty-one cases of recovery. How lamely Dr. Macleod's facts support his conclusions is illustrated by the cases reported by him on page 241, a fatal case of hæmothorax without pneumonia, largely bled, and on page 247, "a soldier of the Buffs. * * He was largely bled, and his symptoms thereby relieved. Ten hours afterward a return of the difficulty of breathing called for further depletion and the use of antimony. *Pneumonia followed!*" Mr. Gant's work has not been reprinted in this country, and it is unnecessary to examine the results of his experience at Scutari. The cases cited by Mr. HOLE (*British Medical Journal*, August 7, 1858) and Mr. MACKAY (*Edinburgh Medical Journal*, Vol. I, p. 924) in laudation of venesection, are their own best answer.

conclusions, and as practitioners generally were inclining to the opinion that it was better for their patients to be set up than to be knocked down, these adverse opinions had little influence.

Opinions had also undergone a great change in this country, and, at an early period of the War of the Rebellion, the compilers of the Confederate surgical *Manual*[1] used the following emphatic language on the subject:

"Equally unphilosophical and more injurious, in our opinion, than even the use of the last class of sedatives, is the time-honored absurdity of venesection. It comes to us embalmed in the dicta of 'the highest authority,' and consecrated by the owlish wisdom of 'the ancients,' and, until recently, the precept has met with submissive and unquestioning acquiescence. We are gratified to find that, in all the cases of arterial hæmorrhage collected in the office of the inspector, *not one* is reported wherein the expedient was practiced by a surgeon of the Confederate States. The measure is one which has doubtless been transferred from civil practice, where it has been found of the greatest value, but in a very different kind of hæmorrhage from that to which some military surgeons have sought to apply it. It is the great reliance—the sheet-anchor—in the *spontaneous* hæmorrhages resulting from *general plethora* or local *visceral engorgements.* For these too much cannot be said in its praise. But for *traumatic* pulmonary hæmorrhages, the measure appears to us not only hazardous, but actually injurious. All the circumstances are different—the cause of the bleeding entirely dissimilar—and hence the *result* of the remedy is, doubtless, often fatally adverse to the ill-founded expectation on which it was applied. Exotics, however vigorous, seldom continue to thrive. So have we found that the *traditions* of civil practice, however reliable, will not always answer as *principles* of military surgery."

In a report[2] to the Surgeon General, published and circulated immediately upon the conclusion of the war, I observed that:

"In the treatment of penetrating wounds of the chest, venesection appears to have been abandoned altogether. Hæmorrhage was treated by the application of cold, perfect rest, and the administration of opium. These measures seem to have proved adequate generally."

This statement has been fully corroborated by a more extended and careful examination of the returns. I can learn of but five instances of venesection after chest wounds, practiced during the war, four observed in the Union and one in the Confederate hospitals.[3] Twice bleeding was practiced, by direction of Surgeon T. Antisell, U. S. V., in cases of traumatic pneumonia, that terminated fatally (cases of A. G———, p. 483, and McClay, p. 550). Three patients, all of whom recovered, were bled for the arrest of primary profuse hæmoptysis. The cases of Kuhn and *Oglesby*[4] have been recorded (pp. 479, 484). The following is an abstract of the third case:

CASE.—Private Richard D. Phelps, Co. E, 25th Ohio Volunteers, aged 19 years, was wounded at Gettysburg, July 1st, 1863, by a fragment of shell, which entered one inch above and just to the inside of the right axilla, fractured the third rib, and passed into the lung. He was treated in the hospital of the 11th Corps, Surgeon Robert Thomaine, 29th New York Volunteers, in charge, until the 11th, when he was transferred to Satterlee Hospital, Philadelphia. The patient stated that on the reception of the injury he bled so profusely that the vein of the left arm was opened, with the effect of soon checking the internal hæmorrhages. He spat up blood, however, until the 10th, but no secondary hæmorrhage set in. His strength was almost exhausted, but he gained daily. Cold-water dressings were applied. When admitted to Satterlee Hospital, the wound, which was about an inch in length, was nearly healed. The probe was soon arrested, the track having closed centrally, but the direction of the wound was downward and forward. There was but slight discharge and no expectoration. The lung, on percussion and auscultation, revealed dulness and bronchial respiration over the central three-fourths, with no respiration over the point of wound. Expectorants, extra diet, and rest were ordered, and cold-water dressings applied to the wound. The case progressed

[1] *A Manual of Military Surgery*, prepared for the use of the Confederate States Army, page 97, Richmond, 1863.

[2] Circular No. 6, S. G. O., 1865, page 21..

[3] See remarks of Surgeon C. S. Woods, 66th New York Volunteers (APPENDIX, p. 88).

[4] This is very probably the solitary case of venesection in chest wounds mentioned by Drs. Thom and Chisolm. See p. 607, *ante*, *Note.*

[5] NEUDÖRFER (*Handbuch der Kriegschirurgie*, Zweite Hälfte, S. 605, in 1867), after his experience in the Italian wars and the Mexican invasion, writes: "We would, therefore, banish venesection from the treatment of gunshot chest wounds not only as an antiphlogistic or curative, but as a prophylactic measure; and even as an hæmostatic means, we cannot admit its value; as venesection, aside from its uncertainty in preventing internal bleeding, reduces the tone of the wounded man and endangers his life."

favorably, and by July 18th the patient's general health was better; he suffered slight pain in the chest a little below the wound. On August 1st, he was transferred to the hospital at Camp Dennison, Ohio, at which time the dulness had entirely disappeared, and he was doing capitally, with every prospect of complete recovery. Phelps was returned to duty on September 22d, 1863; he is not a pensioner. The case is reported by Acting Assistant Surgeon W. W. Keen, jr.

Dr. Chisolm (*op. cit.*, p. 329) deprecates venesection in chest wounds, and gives an outline of the general treatment employed by the Confederate military surgeons:

"Where the heart and pulse are both weak—a common condition after severe wounds—in our experience the abstraction of blood will occasion a complete prostration of strength, and may be fatal. There is no reason for changing the plan of treatment, already discussed in detail, for combating inflammation following gunshot wounds, and which is equally applicable to chest wounds. Even when the lung is inflamed, we prefer the mild antiphlogistic and expectant treatment to the spoliative. The large success in the treatment of perforating chest wounds in the Confederate hospitals puts forth, in a strong light, the powers of nature to heal all wounds when least interfered with by meddlesome surgery. Absolute rest, cooling beverages, moderate nourishment, avoiding over stimulation, with small doses of tartar emetic, veratrum, or digitalis, the liberal use of opium, and attention to the intestinal secretions, will be required in all cases, and in most will compose the entire treatment."

Dr. Ashhurst[1] testifies that, in civil practice, he "has found no reason to adopt a different mode of treatment from that which has proved successful in the surgery of war." It may be regarded as generally admitted that venesection is unnecessary in penetrating wounds of the chest, and that it may be very harmful, and that the "draining of the system of blood," commenced by Bell, Hennen, Guthrie, and Cooper, is to be numbered with the errors of the past.[2]

Of the pharmaceutical preparations employed in the general treatment of the wounds of the chest, discussed in this chapter, opium, calomel, antimony, veratrum viride, aconite, digitalis, hyoscyamus, acetate of lead, gallic acid, saline and other purgatives, hydrochlorate of ammonia, mineral acids and salts of quinia, and epispastics, are prominently noticed.

Opium.—This medicine merits the first place among these remedies.[3] It was used almost universally in all cases of severe wounds, and was found peculiarly useful in penetrating wounds of the chest, in quieting the nervous system, and, indirectly, in moderating hæmorrhage. When used with discretion, there can be no question of its great utility. The inexperienced practitioner should not forget that its effects upon the system are augmented

1 ASHHURST, *Princ. and Prac. of Surg.*, Phil., 1871, p. 399. In his additions to Mr. Erichsen's *Science and Art of Surgery*, Am. ed. 1869, p. 399, Dr. Ashhurst remarks: "The treatment which the author very fairly acknowledges to have been found most successful by military surgeons of the present day, I have found equally satisfactory in cases of penetrating wound of the chest, met with in civil practice. In the later stages, also, the *restorative* treatment, which is now almost universally adopted in cases of idiopathic pneumonia, will generally be found equally efficient, in those of a traumatic origin. Perfect rest, quiet, the administration of opium, with plenty of milk, beef-tea, and even brandy, if necessary, seem to me, in such cases, more truly antiphlogistic than either bleeding, antimony, calomel, or barley-water."

2 FISCHER, K. (*Militairärztliche Skizzen aus Süddeutschland und Böhmen*, Aarau, 1867, p. 61), thus describes the expectant policy pursued in the Swiss Ambulance in the Bohemian war of 1866: He states that he had accurate notes of forty-five cases of penetrating shot wounds of the chest. Twenty-one recovered and twenty-four died, or were likely to die, at the date of the report, or 54 per cent. "The search for balls and fragments of ribs was always cautiously made, and without aggressive manipulation or operation. Even the incised wounds were not closed by sutures, but care was taken to assist the exit of pus by a suitable position of the patient. Neither general nor local bleeding was resorted to; no thoracentesis or drainage was employed; neither emetic nor laxative prescribed; but rest, well ventilated rooms, and nourishing food, with simple dressing of the wound, were provided." Dr. Fisher regards the results as contrasting very favorably with the results he witnessed in the Italian war of 1859, when venesection and antimonials were freely used. In relation to the removal of foreign bodies, NEUDÖRFER (*Handbuch der Kriegschirurgie*, Zweite Hälfte, Leipsig, 1867, S. 590) observes: "As desirable as it is to remove all foreign bodies from the lung, it must be remarked, that their presence in the lung is less injurious than in the pleural cavity. In the lung they are more readily encysted. Missiles have been found in the lung that had remained there for twenty or thirty years without causing much inconvenience, and such cases would be more frequent, if the wounded did not so often perish from the opening of the pleural cavity. But here a discrimination among the different foreign bodies must be made. A leaden missile, a fragment of shell, a piece of stone, can be encysted in the lung; but all foreign bodies liable to decomposition, such as wood and bone splinters, pieces of cotton, linen, and cloth, will never become encysted." SOCIN, A. (*Kriegschirurgische Erfahrungen gesammelt in Carlsruhe*, 1870 and 1871, Leipzig, 1872, S. 86): "The result of a large number of cases cited proves that in penetrating gunshot wounds, where the lung is not at all or only superficially injured, or perforated in its long diameter, an entirely expectant treatment can prove successful. Where the entrance wound in the thorax wall does not remain open, but closes immediately after the passage of the ball, pneumothorax does not appear, a proof that, where the latter exists, it was caused by the influx of the outer air into the pleural cavity, and very rarely by the egress of the air in the lung."

3 NEUDÖRFER (*Handbuch der Kriegschirurgie*, Leipzig, 1867, Zweites Heft, Zweite Halfte, S. 607) remarks: "Of the pharmaceutic means employed in injuries of the chest, opium undoubtedly occupies the first place. I have previously shown the beneficial effect of opium after any injury or operation, as it moderates the reaction following each aggression, and diminishes the interruption of the nervous equilibrium. But in cases of injuries of the chest as well as of the abdomen, it is to be considered as possessing specific powers, not to be replaced by any narcotic whatever."

after profuse loss of blood, and will be guarded in its administration under such circumstances. Medical Director Hewit found great advantage in introducing the salts of morphia by dusting them and rubbing them in upon the surface of wounds, and this practice was frequently adopted by the surgeons under his direction, and was reported to allay local pain very promptly. The hypodermic method was also frequently employed. I think Dr. Squibb is right in pronouncing pure opium, in substance, more reliable than any preparation.

Calomel.—On account of their supposed control over inflammatory processes, mercurial preparations were much employed in traumatic pleuritis and pneumonia. They may be requisite in combating the tendency to exudations in carditis, and with a view to promote the absorption of serous effusions in the pleural cavity. But the estimate of their efficacy in the earlier stages of inflammation following penetrating wounds of the chest has steadily declined of late years, and probably has not yet reached its proper level. Mr. Wharton[1] has ably directed attention to the fact that sufficient importance has not been paid, in the treatment of these lesions, to the necessity of maintaining the blood in such a condition as to favor its coagulability, on which the natural reparative process depends, and that great caution should therefore be exercised in administering any drug likely to appreciably diminish the normal proportion of fibrin.[2]

Antimonials.—Tartrate of antimony and potash[3] was employed to a limited extent to reduce the force of the circulation, and aid in the suppression of hæmorrhage, and also to combat consecutive inflammations. But this remedy shared in the discredit into which venesection had fallen, and was little relied on by Union or Confederate surgeons.

Veratrum Viride.—The rhizome of the American hellebore or Indian poke, prepared as a tincture, was sufficiently valued to be admitted and retained on the Army Supply Table. "For controlling the circulation, liberal use," Professor Gross[4] teaches, "should be made of veratrum viride, its effects being carefully watched, lest too much cardiac depression should arise." The favorable estimate of its utility in traumatic pneumonia entertained by Surgeon Woods, is recorded on page 620. It was much esteemed by other experienced surgeons. I believe that any good results to be obtained from it, may be arrived at with greater certainty and safety by using antimonials combined with narcotics.[5]

Aconite.—Pharmacologists reckon this arterial sedative as useful in active hæmorrhage and in inflammations, and it appears to have been, with a few surgeons, a favorite remedy in some of the complications attending wounds of the chest.[6]

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1 WHARTON. *Two Cases of Penetrating Wounds of the Chest.* Dublin Quar. Jour. of Med. Sci., Vol. XL, 1865, p. 111. The author regrets that in the management of one of the cases he had recourse to the exhibition of mercury, even to a limited extent.

2 By Surgeon General HAMMOND'S *Circular* No. 6, S. G. O., May 4th, 1863, calomel and tartar emetic were directed to be stricken from the Army Supply Table, on the ground that "no doubt can exist that more harm has resulted from the misuse of both these agents, than benefit from their proper administration." Both resumed their places in the Standard Supply Table promulgated in *Circular* No. 6, S. G. O., May 9th, 1867.

3 "It is but rarely that the sedation produced by nauseants, such as antimony and ipecac, can be of judicious application in a case of profuse traumatic hæmorrhage, threatening a fatal termination. Such remedies depress the vital powers too decidedly, and yet often fail to arrest the sanguineous flow. Antimonial preparations are often injurious, if long continued, by their disorganizing effect on the blood."—*Manual of Mil. Sur.* for the use of the Confederate States Army, Richmond, 1863, p. 97. DEMME, reviewing the therapeutic management of chest wounds after the Italian War of 1859, remarks (*Militär-chirurgische Studien in den Italienischen Lazarethen von* 1859, Würzburg, 1861, B. II, S. 114): "I cannot sufficiently caution the army surgeon against the routine treatment by tartarized antimony in the majority of cases. It must not be forgotten that our cases are entirely different from those of the medical practitioner in diseases of the chest. When it is necessary to reduce arterial action, digitalis or veratria should be used."

4 GROSS, *A System of Surgery*, 1872, Vol. II, p. 447. Refer also to Professor GEORGE B. WOOD (*A Treatise on Therapeutics and Pharmacology*, Philadelphia, 1868, Vol. II, p. 153); Professor WILLIAM TULLY (*Materia Medica or Pharmacology and Therapeutics*, Springfield, 1858, Vol. I, Part II, p. 927). See Surgeon CROSBY'S remarks (APPENDIX, p. 11), and those of Surgeon PHELPS (APPENDIX, p. 262); PERCY (*Trans. Am. Med. Assoc.*, 1864); BULLOCK (*Am. Jour. of Pharm.*, Vol. XXIX, p. 204, and March, 1866, p. 98); NORWOOD, *Va. Med. and Surg. Jour.*, Vol. I, p. 198.

5 Pharmacologists are not agreed as to the number or physiological effects of the alkaloids in veratrum viride. I have often observed the effects of the administration of this remedy in cases of pneumonia, in the practice of Professor Tully, who introduced the remedy, and in the practice of his disciples, and thus became convinced of its uncertainty, and liability to produce, in large doses, toxic effects analogous to those caused by tobacco.

6 See PEREIRA. *The Elements of Materia-Medica and Therapeutics*, 3d Am. ed., 1854, Vol. II, p. 1085, and *Edinb. Journ. of Nat. and Geogr. Sci.*, July, 1860, p. 235, and FLEMING, *An Inquiry into the Medicinal Properties of the Aconitum Napellus.* I knew of two instances of fatal poisoning of officers, through mistakes in dispensing the strong tincture of aconite at the field dispensaries. See ORFILA, *Traité de Toxicologie*, 5ème éd., 1852.

Digitalis.—This medicine, usually in the form of alcoholic extract, was often employed; but did not obtain that general confidence which is placed in its remedial powers by the Russian military surgeons. It was used as a succedaneum. Surgeons generally did not accept Dr. Fuller's views as to its physiological action, and followed the precepts of our eminent teacher, Professor Wood, in its therapeutical applications.[1]

Hyoscyamus was occasionally used as a substitute or adjuvant to opium, or, in combination with colocynth, in purgative pills.[2]

Acetate of Lead.—The neutral acetate was employed not infrequently in hæmoptysis, and in cases complicated with diarrhœa, and was usually combined with opium. Sometimes saturnine lotions were used to moisten the compresses placed on irritable wounds.[3]

Gallic Acid.—Gallic acid, tannic acid, and vegetable astringents in substance are mentioned among the prescriptions in cases of chest wounds, especially in those in which there were hæmorrhages or intestinal fluxes.[4]

Saline and Other Purgatives.—Sulphate of magnesia, Rochelle salt, jalap, colocynth, and the compound cathartic pill of the pharmacopœia, were sometimes employed; but usually the patients had loose bowels already, and these remedies, and laxative enemata, were not often called in requisition A few surgeons, mindful of the ancient hæmostatic credit of sulphate of soda, prescribed a black draught with glauber salt, when purgatives were indicated. With the same motive, turpentine was occasionally made a constituent of purgative and expectorant mixtures.[5]

Hydrochlorate of Ammonia.—Sal ammoniac was used to a very limited extent in the progress of cases followed by pneumonia, but did not enjoy the favor with which it is regarded by the German military surgeons. Its admitted liquefactive influence upon the blood should contraindicate its administration in hæmorrhages and traumatic pneumonia.[6]

Tonics.—Dilute aromatic sulphuric acid in sweetened water was a favorite prescription for a drink for patients who had suffered from hæmorrhage. The salts of quinia were largely used in cases with malarial and pyæmic complications. Arsenic was employed, though much less frequently, in similar conditions. Ferruginous preparations and vegetable tonics were administered during the convalescent stage.[7]

Stimulants.—Diffusible stimulants were much used in the depression immediately following the reception of the injury, and often injudiciously and without medical advice, and reaction and the danger of hæmorrhage were thereby augmented. The cautious use of ammonia and brandy was requisite in cases attended by great prostration at the outset.[8]

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1 Consult WOOD (*A Treatise on Therapeutics and Pharmacology*, Phila., 1868, Vol. II, p. 103); GUBLER (*Commentaires Thérapeutiques*, Paris, 1868, p. 103); HOMOLLE and QUEVENNE (*Arch. de Physiologie*, 1854, p. 223); TRAUBE (*Arch. Gén. de Méd.* T. XXVIII, p. 338).

2 On its effects, consult LEMATTRE, *Arch. Gén. de Méd.*, Août, 1865, p. 186; GANOD, *Med. Times and Gaz.*, Dec., 1857, p. 589; SCHROFF, *Wochen blatt der Ges. der Aerzte zu Wien*, Juni 16, 1865; STILLE, *Therapeutics and Materia-Medica*, 3d ed., 1868, Vol. I, p. 765.

3 Consult GOULARD, *Traité sur les effets des préparations de plomb.*, Pézenas. 1760.

4 Refer to WEAVER *Am. Jour. of Pharm.*, Vol. XXIX, p. 82; GUBLER, *Commentaires Thérapeutiques*, p. 579; GMELIN, *Chimie Organique appliquée à la Phys. et à la Méd.*, Paris, 1823; and papers by Drs. NEALE and GRANTHAM and M. SAUMON.

5 WOOD AND BACHE, *The Dispensatory of the United States of America*, 12th ed., 1865, pp. 792, 828; HAMILTON, *Observations on the Utility and Administration of Purgative Medicines in Surgical Diseases*, Edinburgh, 1815.

6 Consult GUBLER, *Commentaires Thérapeutiques*, 1868, p. 403. For its employment in inhalation, see DACOSTA, *Inhalations, etc.*, pamphlet, p. 85, Phil., 1867; GARROD, *The Essentials of Materia-Medica and Therapeutics*. London, 1868, p. 49.

7 See CARSON, *Synopsis of the Course of Lectures on Materia-Medica and Pharmacy delivered at the University of Pennsylvania*, Philadelphia, 1851, p. 72; ROYLE and HEADLAND, *A Manuel of Materia-Medica and Pharmacy*, 3d ed.; TULLY, *Mat.-Med. and Phar.*, Vol. I, Part II, p. 1103; BAYLE, *Bibliothèque de Thérapeutique*, 1837, T. IV, p. 222; LINDLEY, *Flora-Medica*, London, 1858, p. 426; RAFFINESQUE, *Medical Flora*, Philadelphia, 1828, p. 206.

8 Consult FORBES, *Physiological Effects of Alcoholic Drinks*, Boston, 1848; AITKEN, *The Science and Practice of Medicine*, 3d ed, London, 1864, Vol. II, p. 691; BENNETT, *Clinical Lectures on the Principles and Practice of Medicine*, 2d Am. ed., 1863, p. 646; ASHHURST, *Prin. and Pract. of Surg.*, 1871: "Beef-tea and even brandy will, according to my experience, be more often required in cases of lung wound than calomel or antimony," p. 359.

In the later stages, alcoholic stimulants and carbonate of ammonia, in conjunction with concentrated nutriment, were important adjuncts to the restorative treatment. Ergotine was prescribed as an hæmostatic in a few instances, but no evidence of its utility is given.

Epispastics.—Large blisters were recommended by high authority[1] and were often employed in cases of traumatic pneumonia, even in the early stages. There were many surgeons who considered their efficacy in controlling inflammatory processes sufficiently great to counterbalance the suffering they caused, the hindrance to auscultation and percussion, and liability to gangrene and diphtheritic infection their raw surfaces presented.

Doubtless a wise selection and combination of some of these remedies may materially modify and shorten the duration of some of the complications of wounds of the chest; but, with the exception of opium, they are all subsidiary to the operative treatment, the rigid enforcement of mental and physical rest, the regulation of the air, and of the diet. The latter should be severely restricted at first, and, though later, nutritious food is of advantage, it should long be of liquid form and easy of assimilation. I dwell upon this point, because the reports show that many surgeons erred in allowing solid animal food at too early a period.[2]*

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1 See GROSS, *A System of Surgery*, Vol. II, p. 447.

2 STADLANDER, *Diss. de pulmonum vuln.*, Franc., 1683; CRŒSER, J. H., *Dissertatio de thoracis vulneribus*, Lugduni Batavorum, 1716; KOOY, A., *Dissertatio de vulneribus thoracis*, Lugduni, 1738; FRICKE, J. H. G., *Dissertatio de contusionibus pectoris*, Göttingen, 1792; HERHOLDT, *Bemerkungen über die chirurgische Behandlung tiefer Wunden der Brust*, Kopenhagen, 1801; VERING, *Über die eindringenden Brustwunden*, 4to, Wien, 1801; RUMÈBE, E., *Dissertation sur les Plaies d'Armes à feu pénétrantes dans la Poitrine*, 4to, Paris, 1814; BAUDON, *Dissertation sur les plaies pénétrantes de poitrine*, 1815, Thèse de Paris, No. 366; FAURET, F., *Dissertation sur les plaies pénétrantes de poitrine*, etc., 1823, Thèse de Paris, No. 107; MAYER, C., *Tractatus de vulneribus pectoris penetrantibus imprimis cum Hæmorrhagia conjunctis*, Heidelberg, 1823; FRASER, P., *A Treatise upon Penetrating Wounds of the Chest*, London, 1850. Dr. Fraser gives a list (p. 14) which I take the liberty to quote, of all the cases of penetrating wounds of the chest recorded in the *Lancet*, *Medical Times*, *Medical Gazette*, and *Medico-chirurgical Transactions* from their commencement: "LANCET, 1832, August 11th, p. 604; October 27th, p. 159; 1838, June 2d, p. 350; 1841, August 14th, p. 724; 1846, May 9th, p. 533; 1847, January 9th, p. 67; 1851, April 6th, p. 416; 1852, February 14th, p. 193; 1856, June 21st, p. 682, and p. 685; MEDICO-CHIRURGICAL TRANSACTIONS, 1825, Vol. VII, p. 315; 1826, Vol. IX, p. 204; 1841, October, p. 564; 1842, October, p. 615; MEDICAL GAZETTE, 1828, March 29th, p. 512; 1829, October 24th, p. 124; 1830, January 16th, p. 520; 1835, May 2d, p. 146; 1837, November 18th, p. 302; 1838, August 18th, p. 802; 1840, February 7th, p. 721; 1843, May 20th, p. 322; 1845, September 26th, p. 980; 1847, January 22d, p. 1362; 1849, March 16th, p. 483; 1850, October 18th, p. 713; MEDICAL TIMES, 1844, April 6th, p. 21; December 7th, p. 231; 1847, August 20th, p. 512; April 8th, p. ——; 1853, December 17th, p. 638; MEDICAL TIMES AND GAZETTE, Vol. XXXVI, pp. 242, 604." For practical observations on gunshot wounds of the chest during the War of the Rebellion, see *Appendix to Part I, of the Medical and Surgical History*, as follows: By Surgeon A. B. Crosby, U. S. V., p. 11; by Surgeon C. S. Wood, 66th New York Volunteers, p. 88; by Assistant Surgeon J. S. Billings, U. S. A., p. 200; by Surgeon A. J. Phelps, U. S. V., p. 261; by Surgeon W. W. Blair, 58th Indiana Voluunteers, p. 263; by Surgeon D. G. Brinton, U. S. V., p. 293; by Surgeon H. S. Hewit, U. S. V., p. 312. In the American medical periodicals, the following articles may be found, in addition to those already referred to: GALLOUPE, *Gunshot Wound of Chest; Ball removed after seventeen years*, Boston Med. and Surg. Jour., N. S., 1872, Vol. IX, p. 267; KIRKBRIDE, T. S., *Gunshot Wound of the Thorax*, Am. Jour. Med. Sci., Vol. XV, p. 357, O. S., 1834; D'AVIGNON, F. J., *Extensive Wound of the Thorax, Recovery*, Boston Med. and Surg. Jour., Vol. XXXIV, p. 231, 1846; BLANTON, A. M., *Case of Gunshot Wound of the Chest*, Am. Jour. Med. Sci., Vol. XVII, p. 23, 1849; HOOKER, A., *Penetrating Wound of the Chest, Death in eighteen days*, Boston Med. and Surg. Jour., Vol. LXII, p. 223, 1860; ASHHURST, J., Jr., *Cases of Penetrating Wounds of the Chest and Throat, illustrating some important Practical Points*, Am. Jour. Med. Sci., Vol. XLIII, p. 61, 1862; LOMBARD, J. S., *Case of Pneumonia following Gunshot Wound of the Chest*, Boston Med. and Surg. Jour., Vol. LXVIII, p. 471, 1863; CABOT,, *Gunshot Wound of the Chest*, Boston Med. and Surg. Jour., Vol. LXVIII, p. 100, 1863; WALES, P. S., *Gunshot Wound of the Chest*, Am. Jour. Med. Sci., N. S., Vol. XLV, p. 380, 1863; SMILEY, T. T., *Gunshot Wounds, from Arkansas Post, Two Cases of Chest Wounds*, Boston Med. and Surg. Jour., Vol. LXIX, p. 153, 1863. The following references may also be advantageously consulted: WARREN, J. M., *Wound in Chest from Grapeshot*, Surgical Observations, with Operations, Boston, 1867, p. 550; CARRÉ, M., *Considérations sur les Plaies pénétrantes de la Poitrine, compliquées de Lésions aux Poumons*, in Rec. de Mém. de Méd., Paris, 1826, T. XIX, p. 144; GAMA, *Observation d'une Plaie Pénétrante de la Poitrine*, Rec. de Mém. de Méd., Paris, 1822, T. XII, p. 177; HIRN, *Observation sur une Plaie Pénétrante de la Poitrine, suivie de l'Expulsion de plusieurs Portions de la Membrane muqueuse qui tapisse l'intérieur de la Trachée artère*, Rec. de Mém. de Méd., Paris, 1819, T. VI, p. 276; KRIES, H. O., *De Vulneris Pectoris Penetrantibus*, Berolini, 1828; PECHLIN, J. N., *Sistens Historiam Vulneris Thoracis et in eam Commentarium* in HALLER'S Disput. Chir. T. II, p. 531; SCHMID, H., *Über Penetrirende Brustwunden*, Jena, 1867; RICHTER, A. G., *Anfangsgründe der Wundarzneykunst*, Göttingen, 1800; SŒMERING, S. T., *De Morbis Vasorum Absorbentium*, Trajecti ad Moen, 1795; HEURMANN, G., *Abhandlung der Vornehmsten Chirurg. Operationen*, Kopenhagen und Leipzig, 1756; VALENTIN, *Des plaies de poitrine avec épanchement; des signes des épanchements de sang, etc., in Rech. crit. sur la chirurgie moderne*, Paris, 1762; MARJOLIN, *Dictionnaire en 30 volumes*, 1842, T. XXV, p. 413; ANGER, B., *Plaies Pénétrantes de Poitrine*, Paris, 1866.

*Besides the specimens already referred to, the following preparatinos in the Army Medical Museum, Section I, illustrate shot wounds of the lung: *Spec.* 603.—"A wet preparation of the left lung, showing ulceration of the apex, following gunshot. Private W. B. T., Co. E, 4th Maine Volunteers. A bullet entered to the left of the seventh cervical vertebra, and was cut out on the field, just behind the right sterno-cleido-mastoideus, opposite the fourth cervical vertebra, Fredericksburg, December 13th; admitted hospital, Washington, December 18th; hæmorrhage from the anterior wound and cough appeared on 21st; air issued from posterior wound on 27th; died on 28th December, 1862. The right humerus was fractured near the elbow, also. Contributed by Acting Assistant Surgeon F. P. Sprague" (*Cat. Surg. Sect. Army Med. Museum*, p. 480). *Spec.* 606.—"A preparation of the right lung, showing a perforation of the apex, followed by ulceration. A bullet entered near the sterno-cleido-mastoideus, three-fourths of an inch above the clavicle, and escaped an inch to the right of the fourth dorsal vertebra. The specimen is badly cut, as if in dissection. Private V. B. C., Co. C, 16th Maine Volunteers; Fredericksburg, 13th December; admitted hospital at Washington on 18th; cough appeared on 20th; hæmorrhages from anterior wound until 24th; died 30th December, 1862. Contributed by Acting Assistant Surgeon F. P. Sprague" (*Cat. Surg. Sect. Army Med. Museum*, p. 479). *Spec.* 960.—"A preparation of a portion of the left lung, with a battered conoidal ball lodged near the apex. M. F., 88th New York Volunteers; Antietam, September 17th, 1862; admitted hospital at Frederick on 21st, with gunshot fracture head of humerus, which was excised on the 25th; died on October 8th, 1863, from pleuro-pneumonia" (*Cat. Surg. Sect. Army Med. Museum*, p. 478).

There are a certain number of cases of penetrating wounds of the chest that will prove fatal in spite of any treatment, and a certain number will recover if left to themselves. Between these extremes lie a number of cases, some of which will recover, if properly treated, who would otherwise have died, and some will recover perfectly, who would have been left with damaged organs if no treatment had been employed. And it is in regard to the treatment of these manageable cases that it is most difficult to lay down positive rules. They are those in which experience is so useful, and the appreciation of shades of difference scarcely to be expressed in words; but recognized by the educated eye and ear and hand of the enlightened and accomplished surgeon, who has attained that point where scientific principles seem almost to merge in the application of the rules of art. Such a practitioner possesses knowledge which he cannot convey didactically. It may be noticed that our foremost systematic writer on surgery still teaches, in the last edition of his work,[1] that the strictest depletory measures should be employed in penetrating wounds of the chest, and the most rigorous antiphlogistic regimen,—provided, always, that "the system has not been too much drained of blood by the accident," and "the pulse is full and hard and frequent," and the countenance is "hot and flushed." Whereas, "if the reverse be true," lowering agents should be refrained from. Yet, though, during the war, he continually visited the military hospitals in various parts of the country, and gave, whenever his laborious avocations permitted, the benefit of his wise counsel and matured experience to his junior brethren, and must have encountered many cases of injuries of the chest, he appears never to have met with one, at a juncture when the depleting measures he recommends could be considered opportune.

Dr. Fraser has collected a number of cases in which it would appear that patients with chest wounds were literally bled to death. It would be easy to augment the list, and to present, on the other hand, instances as numerous, in which patients survived enormous depletion; and the advocates of phlebotomy would reply, that the instances only proved that the former group of cases embraced those that seemed to demand excessive depletion, and were of such a character as would probably terminate fatally under any treatment, not that the remedy had worked any ill to the patients. It does not appear that the subject admits of solution by the numerical method. The statistics evoked in connection with Dr. Bennett's extended therapeutic enquiry into the utility of venesection in pneumonia, by no means proved that phlebotomy was always prejudicial in that disease; but simply that excessive bleedings in very old or young or slender persons were invariably harmful; while, of the largest series of cases collected on this subject,[2] that in which the mortality was lowest, was taken from the army lists, for periods when moderate bleeding was the prevailing practice. But the assumption that blood-letting, by withdrawing from the circulating medium its excess of fibrine, and other assumptions equally false, and all tending to the conclusion, that the greater part of the blood must be abstracted in order that the disease might be cured,—to bleeding as far as consistent to life, as Ballingall expressed it,—without limit, as John Bell taught,—led to the most reckless and injudicious treatment, in which the reaction of exhaustion was constantly mistaken for renewed inflammation, and met by repeated venesection. The reaction following the discovery of

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[1] GROSS, *A System of Surgery*, 5th ed., 1872, Vol. II, p. 447.

[2] See the *British and Foreign Med-Chir. Review*, Vol. XXII, July, 1858. They are collected from very various sources, and their value in the author's own estimation is apparently not great; for though he strictly analyses those that admit of it, he does not even sum up the figures which he gives as a whole.

the fallacy of these assumptions led to such a state of feeling that a practitioner now hardly dares to use the lancet, whatever his views of its employment may be, and the advantages that might be secured by bleeding in injuries of the lung, in vigorous subjects, in the first day or two after the reception of the injury, and by the use of leeches and scarified cups in pleurisy and cardiac complications, are very rarely sought.[1] In like manner, the want of confidence in the efficacy of mercurials in inflammation appears to have arisen from a growing conviction that their employment is based upon a false theory.[2] In the surgery of the blood-vessels of the chest, I conceive we may fairly look for improvement. It will not be claimed that all the fatal cases of lesions of the mammary, intercostal, axillary, and subclavian arteries, that have been narrated in this chapter, were necessarily beyond the resources of art. It is surely possible to reduce the great disparity in the mortality of ligations for traumatic causes, as compared with the results of operations for aneurism. I rejoice to find myself so fully in accord with my friend, Dr. Lidell, on this subject; and heartily applaud his vigorous invectives against temporization with compresses and styptics, when serious bleeding is going on. "Never be afraid to look your enemy in the face" is as good advice for the surgeon as for the soldier.

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1 Consult Sir THOMAS WATSON'S *Practice of Physic*, 5th London ed.; BENNETT, J. H., *Clinical Lectures on the Principles and Practice of Medicine*, 2d Am. ed., 1863, p. 648; BRYANT, *The Practice of Surgery*, London, 1872, p. 152.

2 Dr. BARCLAY, *Medical Errors*, p. 119, says: "The treatment of acute inflammations by calomel and opium, which was deduced from the supposed action of mercury as a solvent of fibrine, has not been very long introduced into practice. A few years ago experience would have been said to be universally in its favor, especially in the treatment of inflammation of serous membranes. Now, not a few of the most intelligent members of the profession discard it altogether, and a certain vague feeling of doubt as to its efficacy more or less pervades all classes."

The following extract from remarks by Mr. Henry Smith, *Medical Times*, Nov. 23d, 1850, p. 234, should have appeared in the foot-notes to page 613:

"I found, after death, several ribs broken, and the lung severely lacerated by their broken and rugged extremities; yet no bleeding from the mouth had occurred; even if the patient lives for days and weeks, and the lung be severely wounded, there may be no hæmorrhage; the absence of it was striking in a patient of Mr. Partridge, who had received a gunshot wound in his left side, and who lived nearly three weeks. The ordinary signs of pneumonia soon appeared, but there was no hæmorrhage, and it was considered probable that the ball had only taken a superficial course. On *post-mortem* examination, however, it was found that the ball had traversed the substance of the lung, and the most intense inflammation had ensued, which caused the death of the patient. Sometimes emphysema—although, as a general rule, it follows an injury to the lung from a broken rib—will not be apparent; if, with other symptoms, which are even somewhat dubious, this be present, it will set the question at rest. Hæmorrhage, even although a most important sign, as regards the treatment which is to be pursued, is not conclusive of an injury to the lung; nor, on the other hand, as has before been stated, does its absence clearly indicate that there is none."

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PLATE XIII, facing p. 628. METASTATIC FOCUS IN THE LUNG; case of S———, p. 628.

OMISSA.

Page LXXXVIII, Sept. 27, 2d column, after Arkansas, insert *also called Haguewood Station.*
Page 23, 32d line, before fractures, insert *cases of.*
Page 104, 15th line from bottom, insert after June 10th, "1864."
Page 228, 32d line, after Hook, insert *and, on September 27, admitted to the hospital at Frederick.*
Page 232, 12th line from bottom, before 6, insert "1."
Page 386, 25th line, after even, insert *the loss of.*
Page 403, 37th line, after exit, insert *of.*
Page 472, 7th line, after duty, insert *or to modified duty.*
Page 547, 5th line from bottom, after the word recorded, read *and another on p. 456, in wounds and injuries of the spine.*
Page 594, case 14, under column "Reference," insert *Fig. 298, p. 592.*
Page 594, case 19, under column "Reference," insert *Fig. 293, p. 589.*
Page 595, case 31, under column "Reference," insert *Fig. 296, p. 590.*

Page 617.—In a note, it was intended to draw attention to the fact that a hernia of the lung existed in the case of Alexis St. Martin, as reported by Surgeon-General Joseph Lovell, in the *American Medical Recorder*, Vol. VIII, 1825, p. 14.

Page 621, notes.—SOCIN (*Kriegschirurgische Erfahrungen*, Leipzig, 1872, S. 74). "I was astonished to find, at many autopsies, how completely even long shot channels through the lungs would heal, if no foreign bodies had lodged. I have no doubt that a wound through the lung tissues may heal *per primam*. I can also remember cases of shot wounds, in which the thorax was entirely perforated, where I could trace, with the greatest difficulty, the healed or to-a-narrow-fistula-contracted passage of the missile, while the pleural cavity was in a state of complete suppuration."

Page 648, notes.—KLEBS, E. (*Beiträge zur Pathologischen Anatomie der Schusswunden*, Leipzig, 1872, note, S. 123). "I may be permitted to express my regrets, that the large material under Billroth's direction, as regard pathological anatomy, was not entrusted to a technically-educated investigator, as was done at Carlsruhe. Where every surgeon makes his own collection of specimens, the material becomes scattered, and only so much of it will be preserved as is of so-called chirurgical importance, a term of frequently very doubtful significance."

ERRATA.

Page CVI, May 5th to 7th, 10th column, dele Pickett.
Page 220, 21st line, before Assistant, dele Acting.

CORRIGENDA.

Page XIX, note 3, fifth line, for Chisholm, read *Chisolm.* I regret that this error recurs in note 2, p. XX, p. 141, and elsewhere.
Page XXXIV, third line from bottom, for Falling Waters, Maryland, read Falling Waters, *Virginia.*
Page XXXVII, Sept. 15th, for Pritchard's Mills, Virginia, read Pritchard's Mills, *Maryland.*
Page XXXVIII, Oct. 13th, for West Glaze, read *Wet* Glaze.
Page XLIV, April 6th and 7th, for A. M. D. Cook, read A. *McD. McCook.*
Page LXXVII, May 27th, tenth column, for W. T. Sherman, read *T. W.* Sherman.
Page LXXX, July 1st, third column, for G. E. Meade, read G. *G.* Meade.
Page LXXX, July 1st, tenth column, for R. B. Gurnett, read R. B. *Garnett.*
Page LXXXVI, Sept. 1st, third column, for Cryor, read *Cryer.*
Page CXI, June 9th to 30th, tenth column, read *Harker killed, and Daniel McCook, U. S. V., dangerously wounded.*
Page CXIII, fourth line from bottom, for July 21st, read *June 21st.*
Page 12, third line from bottom, for aberation, read *aberration.*
Page 13, thirteenth line from bottom, for Satterlie, read *Satterlee.*
Page 16, note *, third line, for two, read *too.*
Page 26, note 1, fifth line, for denem, read *denen.*
Page 26, note 1, eighteenth line, for Schädverletzungen, read *Schädelverletzungen.*
Page 26, note 1, thirtieth line, for Thiel, read *Theil.*
Page 27, note 3 belongs on page 28.
Page 34, note 1, ninth line, for Kopferletzungen, read *Kopfverletzungen.*
Page 34, note 3, fifth line, for supereiliar, read *superciliary.*
Page 47, fourteenth line, for four following, read *three* following.
Page 73, case of Jones, last line, for Relier, read *Keller.*
Page 75, case of Allington, last line, for McDermot, read *McDermont.*
Page 83, twentieth line, for morphiæ, read *morphia.*
Page 84, twenty-second line from bottom, for pleural, read *pleuræ.*
Page 87, twenty-fourth line, for T. Simons, read *J.* Simons.
Page 101, twenty-second line from bottom, for Aug. 12th, read *September 15th.*
Page 103, third line, for twenty-five, read *twenty-seven.*
Page 103, seventeenth line from bottom, for 1862, read 1863.
Page 104, nineteenth line, for December 10th, read December 19*th.*
Page 105, case of Jarvis C. Wilson, 7th line, for drown, read *drawn.*
Page 106, tenth line, for siter, read *situ.*
Page 109, fourth line, for transforred, read *transferred.*
Page 113, ninth line from bottom, for Thompson, read *Thayer.*
Page 114, thirty-first line, for J. W. Buchanan, Surgeon U. S. V., read J. W. *Buckman, Surgeon 5th New Hampshire.*
Page 117, eighth line, for Assistant Surgeon, read *Acting* Assistant Surgeon.
Page 141, note *, 2d line, for Academie, read *Académie.*
Page 141, note *, 10th line, for Kopferletzungen read *Kopfverletzungen.*
Page 152, thirtieth line, for Dean, read *Deans.*
Page 161, eighteenth line, for May 31st, read May 23*d.*
Page 175, twenty-ninth line, for April 18th, read *June 27th.*
Page 198, fifth line from bottom, for M. G. Sherman, read *S. N.* Sherman.
Page 202, case of Ureh, second line, for conoidol, read *conoidal.*
Page 202, case of Tucker, last line, for Petinus, read *Pettinos.*
Page 205, second line from bottom, for Small, read *Smull.*
Page 209, thirty-first line, for June 24th, read *July 24th.*
Page 216, case of Montague, last line, for Keenan, read *Keenon.*
Page 218, case of Upham, seventh line, for speculæ, read *spiculæ.*
Page 221, case of Sebers, last line, for Bown, read *Bowen.*
Page 222, twenty-third line, for May 31st, read *August 31st.*
Page 227, 5th line from bottom, for Hays, read *Hayes.*
Page 228, thirty-fifth line, for Acting Assistant Surgeon Helsey, read Assistant Surgeon *Helsby.*
Page 232, twelfth line from bottom, for August 6th, read *August 16th.*
Page 234, fifth line from bottom, for August 15th, read August 17*th.*
Page 236, second case, sixth line, for June 27th, read *September 27th.*
Page 240, twenty-second line from bottom, for impared, read *impaired.*
Page 243, fifth line, for February 25, 1864, read February 25th, "1867."
Page 244, fifth line, for Surgeon, read *Assistant* Surgeon.
Page 252, sixteenth line, for 1865, read "1863."
Page 257, eighth line, for December 13th, read December 31*st.*
Page 264, third line, for Starrow, read *Storrow.*
Page 270, third line, for 1865, read "1864."
Page 273, fifth line from bottom, for 1863, read "1862."
Page 277, twenty-first line, for S. Y. Cantwell, read *J.* Y. Cantwell.
Page 278, twenty-second line, for 26th, read "20*th.*"
Page 279, seventh line, for Thomas B. Reeve, read Thomas B. *Read.*
Page 287, ninth line from bottom, for thirty-five, read *thirty-six.*
Page 290, sixth line, for Foward, read *Toward.*
Page 291, ninth line, for W. Ellsworth, read *J.* W. Ellsworth.
Page 296, thirteenth line, for prehenson, read *prehension.*
Page 300, twenty-first line from bottom, for 1863, read "1861."
Page 332, eighteenth line, for Surgeon, read *Assistant* Surgeon.
Page 337, fifteenth line, for 1865, read "1864."
Page 343, note *, second line, for J. Hays, read *I. I. Hayes.*
Page 345, twenty-ninth line, for thirty-five, read *thirty-eight.*
Page 345, third line, for leison, read *lesion.*
Page 345, fourth case, third line, for primative, read *primitive.*
Page 354, last line, for Thompson, read *Thomson.*
Page 358, thirteenth line from bottom, for auditorious, read *auditorius.*
Page 362, sixth line, for 52d New York, read 52d *Pennsylvania.*
Page 362, fifteenth line, for William P. Moore, read William P. *Moon.*
Page 362, seventh line from bottom, for tramatic, read *traumatic.*
Page 365, third case, fourth line, for Batewell, read *Batwell.*
Page 367, ninth line from bottom, for abstract, read *abstracts.*
Page 368, third case, second line, for lachrinal, read *lachrymal.*
Page 378, fifth line from bottom, for six months, read six *weeks.*
Page 383, fourth line, for 26, read "2.6."
Page 398, note *, first line, for Virinerum, read *Vulnerum.*
Page 405, fifteenth line from bottom, for Baltimore, Maryland, read *Alexandria, Virginia.*
Page 417, fourth line, for U. S. V., read *P. A. C. S.*
Page 423, fifteenth line, for .78, read 78 *per cent.*
Page 423, seventeenth line, for .75, read 75 *per cent.*
Page 426, sixth line, for 1863, read "1865."
Page 426, twenty-fourth line, for W. Dusenbury, read *H.* Dusenbury.
Page 432, twenty-second line from bottom, for Baltimore, Maryland, read *Harper's Ferry, Virginia.*
Page 435, seventeenth line, for 1865, read "1864."
Page 442, fourth line from bottom, for T. Kriker, read *J. Kirker.*
Page 445, ninth line from bottom, for dorsal, read *lumbar.*
Page 448, thirty-first line, for promply, read *promptly.*
Page 463, twenty-second line, for Ballingal, read *Ballingall.*
Page 473, case of Pieree, fourth line, for extrance, read *entrance.*
Page 474, thirtieth line from bottom, for 1864, read "1862."
Page 489, fifteenth line from bottom, for 101st, read 106*th.*
Page 509, twenty-first line from bottom, for anditorious, read *auditorius.*
Page 527, second line from bottom, for bony substance, read *lung* substance.
Page 537, fourth line from bottom, for ateriaum, read *arteriarum.*
Page 547 fourth line from bottom, for fifty-two read *fifty-three*, and, on next line, for forty-one, read *forty-two*, and for 78.8, read "79.2," and, for Bilroth, read *Billroth.*
Page 557, twenty-second line, transfer asterisk to line fifteen, after the word management.
Page 570, note 4, first line, for Verhandes, read *Verbandes.*
Page 573, case of Bivens, seventh line, for Isa, read *Ira.*
Page 582, second line, for lodgment, read *lodgement.*
Page 595, case fifty-seven, for 4455, read "5640."
Page 607, twenty-third line, for Bead, read *Read.*
Page 610, note 4, eleventh line, for cordform, read *cordiform.*
Page 613, note 5, fourth line, for kave, read *have.*
Page 613, fifth line from bottom, for 1713, read "1813."
Page 614, note 1, first line, for Ferrien, read *Ferrein.*
Page 617, thirty-first line, for nine-four, read *ninety-four.*
Page 629, note 4, for Wolf, read *Wolfe.*
Page 638, twenty-fourth line, for symtoms, read *symptoms.*
Page 645, twenty-second line, for commenced, read *commended.*

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